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**“The Effects of Management Education upon Strategic
Practice and Performance:
The Case of the German SME Machinery and
Equipment Sector”**

**Thesis submitted to the University of Glasgow
for the Degree of Doctor of Philosophy**

by

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May 2010

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For my Parents

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Thesis abstract

This thesis is concerned with understanding the nature and impact of strategic management education upon management behaviour and performance. Previous research findings are limited, with continuing research being proposed. The aim of this research is to fill respective gaps.

The research is carried out in the German machinery and equipment industry sector. This sector was selected because it is of strategic importance for Germany's economy and it is faced with imminent and ongoing challenges. The research concentrates on small and medium sized companies as these companies dominate this sector.

The desk research consists of a comprehensive literature review on the subjects: strategic management, SME community and research sector, previous empirical research results and management education.

The field research adopts a quantitative methodology with a survey questionnaire in a cross sectional time horizon. The field research is complemented by six "micro case studies" using qualitative data from the questionnaire and publicly available information.

Findings suggest that management education and, in particular, strategic management does not play an important role in German universities. Engineering faculties generally neglect strategic management education in their curricula. Evidence suggests that executives with engineering background have less knowledge in strategic management and generate a lower return on sales than those with business economic background or MBA qualified. From the research findings it can be concluded that German SMEs in the machinery and equipment sector profit from the implementation of strategic management.

This thesis closes with recommendations to policy makers regarding management education in Germany and proposals for further research.

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List of acronyms

A.D.	Anno Domini
AG	Aktiengesellschaft (stock corporation)
AHK	Aussenhandelskammer (Chamber of Foreign Trade)
ANOVA	Analysis of variance
Apx	Appendix
AQA	Australian quality award
AQAP-1	Allied quality assurance specification
AWU	Annual work unit
BA	Bachelor of Arts
BAA	British Airports Authority
Basel II	Basel II covers the rules for bank loans to enterprises; see EU Regulation 2006/48/EG and 2006/49/EG effective since 1. January 2007
BBA	Bachelor of Business Administration
B.C.	Before Christ
BCG	Boston Consulting Group
BDI	Bundesverband der deutschen Industrie e.V. (Association of the German Industry)
BDU	Bundesverband Deutscher Unternehmensberater e.V. (Association of German Management Consultants)
BIS	Department for Business, Innovation and Skills (UK)
BMBF	Bundesministerium fuer Bildung und Forschung (Federal Ministry of Education and Research), Germany
BM/F	Betriebswirtschaftliches Forschungszentrum / Mittelstand (Economic Research Center / SME), Germany
BMJ	Bundesministerium der Justiz (Federal Ministry of Justice), Germany
BMWF	Bundesministerium fuer Wissenschaft und Forschung (Ministry of Science and Research), Austria
BMWT	Bundesministerium fuer Wirtschaft und Technologie (Ministry of Economy and Technology), Germany
BS	Bachelor of Science
BSJ	Bayerisches Staatsministerium der Justiz und fuer Verbraucherschutz (Bavarian State Ministry of Justice and Consumer Protection)
BVMW	Bundesverband mittelstaendischer Wirtschaft e.V. (Association of the SME Economy), Germany
BVR	Bundesverband der deutschen Volksbanken und Raiffeisenbanken (Association of German Savings Banks)
c.	Circa
CAD	Computer aided design
CAM	Computer aided manufacturing
CBI	Confederation of British Industries
CDU	Christlich Demokratische Union (Christian Democratic Union)
CIM	Computer integrated manufacturing
CSU	Christlich Soziale Union (Christian Social Union)
CWQC	Company-wide quality control
DGQ	Deutsche Gesellschaft fuer Qualitaet (German Society for Quality)
DIHK	Deutsche Industrie und Handelskammertag (German Chamber of Industry and Commerce); umbrella organisation for all local IHK offices in Germany
DIN	Deutsches Institut fuer Normung e.V. (German Institute for Standardisation)
DtA	Deutsche Ausgleichsbank
EBIT	Earnings before interest and tax
ECTS	European Credit Transfer System
EEA	European Economic Area = EU-15 plus Iceland, Liechtenstein, Norway
EFQM	European Foundation for Quality Management
EFTA	European Free Trade Association
EIB	European Investment Bank

EN	Europäische Norm (European standard)
ENSR	European Network for Social and Economic Research
EQA	European quality award
ERP	European recovery plan
ERP	Enterprise resource planning (SAP software)
ESMT	European School of Management and Technology (Berlin, Germany)
EU	European Union
EU-15	Member States Austria, Belgium, Denmark, Germany, Greece, Spain, France, Finland, Ireland, Italy, Luxembourg, Netherlands, Portugal, Sweden, United Kingdom
EU-19	EEA plus Switzerland, Liechtenstein, Norway and Iceland
e.V.	Eingetragener Verein (registered association)
ExBa	Excellence Barometer
F.A.Z.	Frankfurter Allgemeine Zeitung
FIBAA	Foundation for International Business Administration Accreditation
F&C	Finance and controlling
GDP	Gross domestic product
GMAT	Graduate management admission test
GmbH	Gesellschaft mit beschränkter Haftung (limited liability company)
GmbH & Co. KG	Sonderform der Kommanditgesellschaft (limited partnership with a limited liability company as general partner)
GSBA	Graduate School of Business Administration, Zuerich Switzerland
HE	Higher education
HGB	Handelsgesetzbuch (commercial code)
HR	Human resources
IAB	Institut fuer Arbeitsmarkt- und Berufsforschung (Institute for Labour Market and Vocational Research)
i.e.	Id est (that is)
IFAK	Institut fuer Markt- und Sozialforschung (Institute for Market- and Social Research)
IfM	Institut fuer Mittelstandsforschung, Bonn, Germany (Institute for SME-Research); member of the ENSR
IG	Industriegewerkschaft (industrial union)
IHK	Industrie und Handelskammer (Chamber of Industry and Commerce)
ISIC	International Standard Industrial Classification
ISO	International Standards Organization
IWF	Internationaler Währungsfonds (International Monetary Fund, IMF)
KfW	Kreditanstalt fuer Wiederaufbau; (Bank Group including Bank for the German Mittelstand)
KG	Kommanditgesellschaft (limited partnership)
KMU	Kleine und mittlere Unternehmen (small and medium-sized enterprises)
KonTraG	Gesetz zur Kontrolle und Transparenz im Unternehmensbereich (bill for control and transparency within companies), corporate governance, implemented 27.April 1998
KPI	Key performance indicator
LLL	Lifelong learning
LSE	Large scale enterprises
MAS	Military Agency for Standardization
MBA	Master of Business Administration
MBNQA	Malcolm Baldrige National Quality Award
M+E	Machinery and equipment
MIL-Q	Military standard for quality program management
MIL-STD	Military standard
MS	Master of science
MS	Microsoft
NACE	Nomenclature statistique des Activités économiques dans la Communauté Européenne (General Industrial Classification of Economic Activities within the European Communities)
NASA	National Aeronautics and Space Administration
NATO	North Atlantic Treaty Organisation

n.e.c.	Not elsewhere classified
NGO	Non-governmental organisation
n.s.	Not specified
OECD	Organisation for Economic Cooperation and Development
OHG	Offene Handelsgesellschaft (general partnership)
OLA	Open Learning Agency
PACAP	Potential absorptive capacity
P	Probability (in hypothesis testing)
PC	Personal computer
pdf	Portable document format (by Adobe Systems)
PIMS	Profit impact of market strategy
RACAP	Realised absorptive capacity
RBV	Resource-based view (of strategic management)
R&D	Research and development
RMB	Renminbi (Chinese currency)
ROS	Return on sales; (profit before tax / turnover)
S	Standard deviation
S ²	Variance
SCP	Structure conduct performance paradigm (Porter)
Sig.	Significance (in hypothesis testing)
TPI	Thinking Person's Institute
TQC	Total quality control
TQM	Total quality management
SM	Strategic management
SME	Small and medium-sized enterprise
SP	Strategic planning
SPSS	Statistical package for social science
SWOT	Strengths, weaknesses, opportunities, threats
UK	United Kingdom
UoG	University of Glasgow
URL	Uniform resource locator
US; USA	United States of America
VAT	Value added tax
VDI	Verein Deutscher Ingenieure (Association of German Engineers)
VDMA	Verband Deutscher Maschinen- und Anlagenbau e.V. (Association of German Machinery and Equipment Manufacturers)
VDW	Verein Deutscher Werkzeugmaschinenfabriken e.V. (Association of German Machine Tool Manufacturers)
WHO	World Health Organisation

1 Introduction to the research project

“Research work is usually extensive, built up over years. It develops and expands the knowledge and capacities that makes the insight possible.”

D. B. Wallace and H. E. Kruwer (Quoted in Handelsblatt, 2005, p. 42)

1.1 Introduction

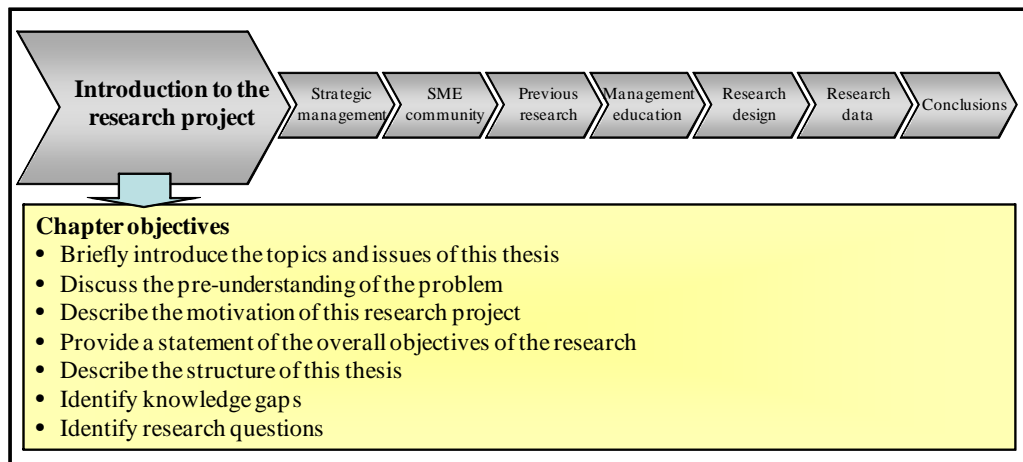


Figure 1.0: Objectives chapter 1

Source: Developed by researcher

Strategic thinking and strategies have a long history (Meyers, 1990; PBW, 2007). In the early 1950s, management scientists introduced them to the world of business (Cyril & Magee, 1953; Shubik, 1955). Since that time, academics and business consultants have published countless books, papers and research results on strategic management. There are controversies in the discussions of the process, the tools and the benefits of strategic management (Vasconcellos e Sá, 1989; Mintzberg, 1994).

Micro, small and medium-sized enterprises (SMEs) make up a large part of the European economy and employ the vast majority of the working population (European Commission, 2005). Germany hosts the second largest SME community in Europe (European Commission, 2004) with over 3 million enterprises. Germany's SMEs are called "Mittelstand" for which certain peculiarities apply (Fackel, 1962; Gabler, 2005).

The research sector, Germany's machinery and equipment industry with about 6,100 enterprises (VDMA, 2005) is of strategic importance for Germany's economy. It is a constant source of innovation, progress and wealth (Wiechers, 1995).

Evidence shows that SMEs are less inclined to apply strategic management (Schmidt & Freund, 1989; Hamer, 1990; Pfohl, 1990; Menke et al., 1996; Harhoff et al., 2001). SMEs, in particular, in Germany's machinery and equipment sector are largely managed by engineers (VDMA, 2007a). Engineers, in turn, receive little or no education in strategic management at German universities (RWTH Aachen, 2003; FHWS, 2007): they enter the labour market without it and, sooner or later, achieve a managerial position.

This research project is concerned with understanding the nature and impact of strategic management education upon management behaviour and performance and aims to fill respective knowledge gaps.

Figure 1.0 list the objectives for this chapter.

1.2 Strategic management; a brief introduction

From the time of the ancient Greeks until the middle of the last century, strategies and strategic thinking and action have been a military preserve (Meyers, 1990; PBW, 2007). In the early 1950s, Cyril & Magee (1953) introduced the "theory of games" in a paper on operations research and suggested the development of strategic concepts through the application of game theory. Shubik (1955, p.42) followed this up, defining game theory further and placing the military situation in context with that of business, stating: "*A strategy in war or in business is the same. It is a general plan of action, containing instructions as to what to do in every contingency*". Cyril, Magee and Shubik therefore abstracted strategic management from military science and started the deployment of strategic management in the world of business and in the science of management. Even today, strategic management is compared with the military (Wagner, 2004): some business schools teach the art of business warfare (Goergen, 2003).

Since the introduction of strategies and strategic management, management scientists and consultants have published many papers and books on this subject. They designed and proposed models and tools and carried out research projects on the subjects of strategies, strategic thinking, strategic planning and strategic management. Payne (1957) introduced long range planning for businesses and Ansoff (1957) promoted strategies for products and markets known as the Ansoff product-market grid. Chandler (1962, p. 39) set the organisational structure in context with the strategy "*structure follows strategy*". Peters (1984, p. 111) suggested the opposite: "*Strategy follows structure*"; strategy evolves from inside the organisation and not from a future environment.

Drucker (1985) defined the features of strategic planning. McCarthy et al. (1975) described the strategic management process as depicted in Figure 1.1. They defined the basic elements of strategic management as strategy formulation and strategy implementation and evaluation. Strategic planning builds the bridge between both basic elements. Although this model does not emphasise the iterative approach to strategic planning, it is still a valuable description of what strategic management is about. Eventually, strategic management models were introduced e.g. by Malik (1981), Bleicher (1991), Amann (1995), Hinterhuber (1996), Hahn & Taylor (1999), Welge & Al-Laham (2003) and Steinle (2005). They emphasise certain elements such as the iterative approach, environmental structures, early warning systems or the integrated or holistic view. The models and papers take it for granted that the executives have the required knowledge and skills in strategic management.

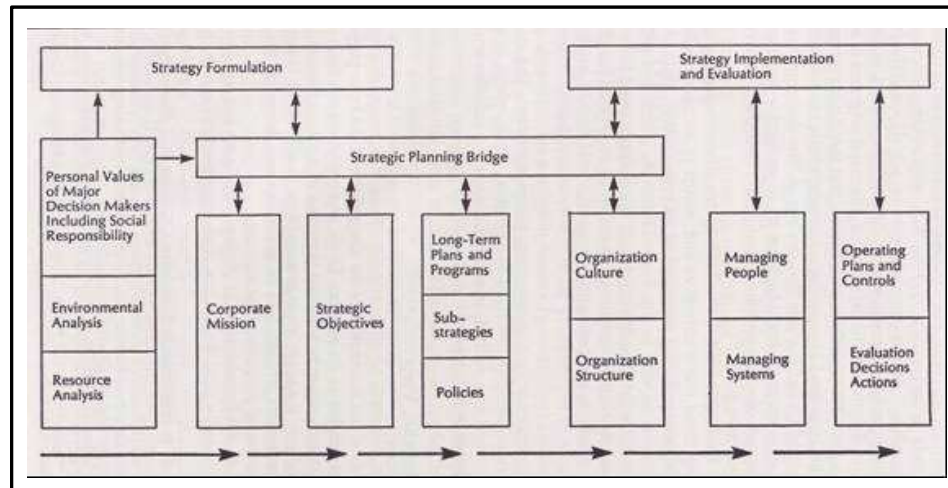


Figure 1.1: The strategic management process

Source: McCarthy et al. (1975)

Despite all the euphoric positive papers and books on strategic management and strategic planning, there are also critical voices. Mintzberg (1994), for instance, argues that strategic planning is an oxymoron. Planners blame problems with strategic planning on such pitfalls as lack of top management support and an organisational climate which is not congenial to planning. The strategic planning process in itself may generate an uncongenial climate. One could argue that if the top management does not support the planning process, the organisation will not support it and resist it, which is then perceived as an uncongenial climate. In addition it depends upon the degree of professionalism on how strategic planning is carried out (Held et al., 2007).

Vasconcellos e Sá (1989, p. 177) reports that most strategic planning systems he has seen are rituals. He states that forms are filled out with “*pious platitudes and vague intentions; a ritual rain dance, which has no effect on the weather*”. If the strategy is based on wrong assumptions, is badly formulated and poorly implemented, it does more harm than good to an organisation. One could argue that this is a question of knowledge and skills and having the right employees at the right place. It would be wrong to question strategic management per se. Nobody would argue about the quality of a Stradivarius violin if it is played by an unskilled amateur player.

Hayes (1985) discusses the loss of competitive position of the US manufacturing industry although much effort is spent on strategic planning. He suggests a means-ways-ends sequence (means = resources; ways = strategy, ends = objectives) in strategic planning versus the traditional ends-ways-means approach. Hayes (1985) mentions that managers in the USA overemphasise quantitative objectives and argues that they pay more attention to strategic management and that management in general is more advanced than in other industrialised nations.

Strategy execution is the other major part of strategic management. Kaplan and Norton (2006) stress the fact that in many companies there is a gap between strategic planning and execution. Often, executives do not follow strategies, do not cascade down the objectives, do not involve the employees, do not define action plans and do not follow up and follow

through. Welch & Welch (2005, p. 196) address this issue by stating: *“Each strategy, no matter how intelligent it is, is lifeless if it is not awakened by the employees in the enterprise – by the right employees”*. They highlight the word “right” and argue for personality and abilities.

Dwight D. Eisenhower, General and 34th President of the United States of America once said: *“Plans are nothing; planning is everything”* (Handelsblatt, 2005, p. 76). What he probably intended to express is that the plans become quickly obsolete in a fast changing environment and that planning must be an ongoing iterative process.

Chapter 2 discusses in detail the history and state of strategic management.

1.3 SMEs and the German Mittelstand peculiarities

1.3.1 The SME community in Europe

Micro, small and medium-sized enterprises (SMEs) play an important role in Europe’s society and economy as they make up a large part of the economy and employ the vast majority of the working population (European Commission, 2005).

From 1 January 2005, the EU installed a new classification of SMEs. Three parameters: staff headcount; annual turnover; and annual balance sheet total were defined with threshold values for the SME categories. Micro enterprises shall employ up to 9 persons and the annual turnover or balance sheet total shall not exceed € 2 million, while small enterprises are classified with up to 50 employees and € 10 million turnover or balance sheet total. The values for medium-sized companies are 250 employees and € 50 million for annual turnover or balance sheet total (European Commission, 2005a). Beyond these threshold values, companies are considered as large scaled enterprises (LSEs). The main objective of the new SME definition is to promote innovation and partnership and to assure that only those enterprises that need support are targeted (European Commission, 2005a).

1.3.2 The SME community and the Mittelstand in Germany

Germany hosts the second largest SME community in Europe-19 (European Commission, 2004) with over 3 million enterprises.

Historically, the Mittelstand in Germany emerged from the craft sector in the middle of the 18th century (Meyers, 1990). In a sociological context, “Mittelstand” is the description of the “Mittelklasse” (middle class) in Germany. The Fackel-Lexikon, an encyclopaedia, defines “Mittelstand” as *“the social class between poor and rich consisting of farmers, craftsmen, public officials, self-employed persons, traders and, to some extent, salaried employees”* (Fackel, 1962, p. 520).

In an economic context, the term “Mittelstand” denotes a certain category of enterprises: this term is only used in context with German enterprises. In other European countries and

in the United States, the term SME is used to characterise the size of the enterprise. The acronym KMU (kleine und mittlere Unternehmen) is used in recent years in Germany as a synonym for Mittelstand and as a translation for SME. However, this translation does not precisely convey the nature or character of the German Mittelstand. The terms SME or KMU classify enterprises by statistical data such as number of employees, turnover and balance sheet total only. In German society today, the Mittelstand also links qualitative aspects such as unity of ownership and management responsibility (Gabler, 2005). Thus, even large companies run by the owner(s) or family are considered a “Mittelstand” enterprise. This so-called “gehobener Mittelstand” (upper Mittelstand) has no threshold limits for employees or turnover and thus leaves the definition open as mentioned by Evelin Schoenhut-Keil in a Speech to the Hesse Parliament on June 6, 2005 “*..wie immer gehobener Mittelstand nun definiert ist..*” (..whatever the definition of upper Mittelstand is...) (Schoenhut-Keil, 2005, p. 1).

Internationally, the term Mittelstand is also used to characterise the specific family-owned and conservatively run companies in the Federal Republic of Germany. The Mittelstand companies, mostly established around the turn of last century and after World War II, are characterised as the major driving force for Germany’s industrial growth and wealth (Muzyka et al., 1997). The “Economist” credits the Mittelstand for the post-war “Wirtschaftswunder” (economic miracle) in the 1950s and 1960s (Anon, 1998).

Chapter 3 describes in detail the SME community in the European Union and Germany.

1.4 The research sector machinery and equipment

Germany’s machinery and equipment industry sector had over 6,000 enterprises and a turnover of € 132.6 billion in 2002. This sector provides work for around 900,000 employees (VDMA, 2005) and it is one of Germany’s most important growth sectors (IDW, 2005). However, it is faced with numerous challenges such as competition from Far East (Baron, 2005; Sieren, 2005; Impuls, 2007; VDMA, 2007).

The researcher has chosen the machinery and equipment sector for the following reasons:

- It is of very high importance to German and European society and economy.
- There are major challenges ahead that require sound strategic management.
- This industry sector has already gone through a massive structural crisis in the years 1991 – 1994 (Zechlin, 1995). Have the lessons been learned?
- This sector is driven by engineers.
- The researcher is an engineer and has many years of insider knowledge and experience.

Chapter 3 describes in detail the SME history, current status and future challenges of the machinery and equipment sector.

1.5 SMEs, Mittelstand and strategic management

Since the end of the 1970s, many research projects, empirical studies and statistical evaluations regarding strategic thinking, strategic management and strategic planning in German SMEs and Mittelstand companies have been carried out and published by universities, institutes, associations and consulting companies. The results can be summarized as follows:

- SMEs are flexible and fast in the decision process, they are pragmatic not theoretical (Geiling, 1982).
- SMEs are more employee-orientated than LSEs (Hamer, 1990).
- Family owned businesses often run into executive succession problems (Hofmann, 2004).
- There is a huge productivity improvement potential if a holistic HR strategy is applied (Vogel, 2005).
- SMEs concentrate on market niches, but lack strategic marketing procedures and marketing intelligence (Pfohl, 1990; Harhoff et al., 2001).
- SMEs lack strategic innovation management (Heidenreich & Wimmers, 2007).
- SMEs, especially in the machinery and equipment sector, tend to concentrate on export and not in direct investment in foreign countries (Schmidt et al., 1995).
- SMEs in the machinery and equipment sector are engineering driven. The leaders concentrate on innovation and often neglect planning (Horváth & Weber, 1990; Wossidlo, 1990).
- Obstacles to growth in SMEs have been identified. The majority can be traced to poor management practices. Larger SMEs have more advanced management practices than smaller SMEs (Geiser, 1983; Kayser, 1987).
- SMEs in the machinery and equipment sector lack control and early warning systems (Kriegbaum, 1995a).
- The strategic planning process is neglected in many SMEs. Strategic plans often do not exist. The extent of strategic planning applied is related to the size of the SME. Smaller SMEs do less strategic planning. There is evidence of the positive impact of long-term strategic planning on the success of a company (Schmidt & Freund, 1989; Hammer, 1990; Menke et al., 1996).
- SME leaders often do not take the necessary action to execute the strategy and advance the business (Waldmann & Wagner, 2003).
- Almost 30% of German SMEs do not carry out strategic planning at all (KfW, 2004).
- Only about 50% of the SMEs have an early warning system in place (BDU, 2005).

- The majority of successful companies have explicitly formulated strategic objectives including defined indicators and communicate them to the employees (Becker et al., 2006)
- Obstacles to strategic planning are time constraints, missing resources, missing awareness and competence problems. Lack of strategic planning can be related to management education (Held et al., 2007).
- Lack of strategic thinking and action as well as the lack of strategic experience is one of the main weaknesses of German managers in LSE and SMEs (Dembkowski, 2007).

Most of the SME research cited above concentrates on how and to what extent strategic thinking, management practices, strategic management and strategic planning are applied. Some research reveals what impact it has on the business. The education of business leaders regarding management practices, strategic management and strategic planning is, however, more or less neglected. Kayser (1987), Held et al. (2007) and Dembkowski (2007) touch on the issue of education. In their research, Held et al. (2007) reveal the relation of management skills and education with the application of strategic management.

At this time, there is no comprehensive research study available on German SMEs which covers the education and skill issues of strategic management in depth.

Chapter 4 discusses in detail the empirical studies and statistical evaluations on strategic management in German SMEs and Mittelstand companies.

1.6 Management education and the engineer's dilemma

German companies employ around 110,000 mechanical engineers (Staufenbiel, 2007).

In Germany, engineering can be studied at both universities of applied science (Fachhochschule) and technical universities (technische Hochschule or Universität). The universities of applied science are more practice orientated. Students graduate with the academic title Dipl.-Ing. (FH), whereas technical universities are more orientated towards theory. Students graduate with the academic title Dipl.-Ing. (TH). Graduates from technical universities may continue with doctoral studies and gain the academic title Dr. Ing.

In addition, since the mid 1970s, most German universities who have engineering affiliates also offer "Wirtschaftsingenieur" (business engineer) studies. This is a combination of engineering and business economy.

The curricula for engineering studies offer little or no education in general management or strategic management (Bundesagentur fuer Arbeit, 2007; RWTH Aachen, 2003; FH Deggendorf, 2007; FHWS, 2007; TU Clausthal, 2009).

The Wirtschaftsingenieur curricula include management functions such as operations research, quality management, finance, controlling, marketing and general management, as well as business start up (Bundesagentur fuer Arbeit, 2007).

Feller & Stahl (2005) define, in a study, the future demands of higher education and curricula of engineers. General management and strategic management are neglected. They argue for basic knowledge in business economics and excuse this argument by stating that they do not mean to educate engineers as semi-business economists. Staufenbiel (2007) argues that in SMEs in the machinery and equipment sector, engineers are more quickly promoted to top management positions than in other industry sectors and employers expect knowledge in management and marketing. Engineers with additional qualifications in these areas are preferred candidates. Staufenbiel, however, fails to argue for management education for engineers at German universities. Schmauder (2007) argues that companies prefer engineers with management knowledge and that executives notice a lack of management knowledge in young engineers. Around 70% of graduating engineers want a career in a management position. Sattelberger (2007), a business economist, suggests a more praxis orientated engineering curriculum, but does not ask for improved management education. Sattelberger is probably unaware that 64% of the German top executives in sector machinery and equipment are engineers and at vice president level about 56%. A good half of both populations are mechanical engineers (VDMA, 2007a).

Since the curricula for business economists include more management courses (BMBF, 2006a; Bundesagentur fuer Arbeit, 2007) than the curricula for engineers does, one could argue that universities expect business economists to manage companies and not engineers. The reality is different, especially in the machinery and equipment sector. Here, top management is dominated by engineers (VDMA, 2007a). This fact appears to be neglected by German universities.

The enrichment of the curricula at German universities with strategic management has, unfortunately, been given little attention. This could be the reason why German top executives lack competence in strategic management (Dembkowski, 2007).

In other countries around the world, management scientists researched and published on the issue of improved management skills of engineers and adaptation of university curricula. In Australia, Bates et al. (1992, p. 4) complains: *"Australian engineers are well prepared in engineering technology, but not well prepared for the full practice of engineering in its managerial and business dimensions"*. Steiner (1998), Australia, considers management skills important to the success of an engineering career. Management content is included in the curriculum in Australian undergraduate engineering courses (Palmer, 2000). Valiulis & Radzeviciene (2004) argue for innovations in engineering curricula at Baltic universities and include management education. In Canada, Deo (2006, p. 26) strongly proposes that technical knowledge be complemented with management knowledge and states: *"If young engineers crave business education, why make them wait so long?"* Director (2006) and Hoyningen-Huene (2006) at the International Mechanical Engineering Education Conference in Beijing 2006 argued for business and management skills for the "modern engineer". In Japan, the Kochi University of Technology offers an entrepreneur engineering course including global management (Momota et al., 2006). Batley (1987) surveyed the needs of professional engineers in New

Zealand, 73% felt they needed more management education and training. Taylor and Machado (2006), in Portugal, suggest improved leadership and management education in context with improved strategic planning process. In Thailand, Bland (2006) suggests a new international engineering masters programme with management content as an answer for the increasing needs for entrepreneurial abilities of graduate engineers.

In the United Kingdom, Smith & Patterson (2002, p. 1) report on a survey which revealed that *“young people in the UK have a negative perception of the field of engineering. It is regarded as difficult, dull, dirty and dangerous, with limited financial rewards and career prospects and low social esteem”* and recommend that young people should be made aware of the rewards of engineering. In addition, they propose joint engineering and business case studies as well as entrepreneurial training for engineers. In their “Innovation Survey 2005” the CBI (2005) report that UK graduates lack innovation skills and in successive surveys (CBI, 2007, 2007b, 2008) consider that leadership and management skills are vital to the UK’s economic performance, arguing that leadership, management, entrepreneurship should be included in higher education. They CBI (2007a) also recommend that employability skills and knowledge in the engineering sector be improved. Employability skills are considered to be organisation and planning, leadership, decision making and problem solving (University of Kent, 2009). The BIS (2009, p. 4) report the results of a review in the UK Engineering Construction which showed that *“the technical skills of the UK workforce are as good as those in other countries”*, but they express concern on the quality of the advisory staff. Pearson (2007, p. 1) states that *“.. sustainable companies of tomorrow will need engineers that can help them find ethical, environmentally sound solutions ..”*.

Gassert et al. (2007, p. 2), USA, suggest to *“convince engineering faculties of the importance of educating engineering entrepreneurs and integrating entrepreneurship into an engineering curriculum”*. Kuo (1998), USA, argues that the traditional engineering curriculum fails to address the needs of today’s industry, but he does point out the importance of education in management. Kumar et al. (2005), USA, suggest the infusion of sustainability (ecology) into the manufacturing and mechanical engineering curricula, but they fail to address management education.

“Der Ingenieur ist der Esel auf dem der Kaufmann zum Erfolg reitet” (the engineer is the donkey the business man rides on to his success) Wegener (2006, p. 1). This saying in the German speaking part of Europe is an attempt to express the engineer’s preoccupation with inventions, processes and products, but not with management, which is done by the business man who uses the engineer for his success. The researcher, also an engineer, suggests an addition ... *“if he - the engineer- is not educated in management”*, to this saying, which is cited as an argument for more management and business competences in the engineer’s education.

Chapter 5 describes in detail the state, practice and impact of management education.

1.7 Pre-understanding the problem

Although it is controversially discussed by management scientists (Vasconcellos e Sá, 1989; Mintzberg, 1994a; O'Regan & Ghobadian, 2007), the researcher believes that strategic management and its sub-element, strategic planning, are important prerequisites for the success of an enterprise. However, it may be hard to prove or measure the relation between strategic planning and performance. Rhyne (1986; p. 432) argues that it is difficult to specify “*whether strategic planning resulted in superior performance or superior performance permitted strategic planning*”. Pearce et al. (1987, p. 673) consider the link between formal strategic planning and financial performance as “*tenuous*” and suggest that “*the characteristics of formal strategic planning*” be determined. Other management scientists (Schwenk & Shrader, 1993; Baker, 2003) point out that it is difficult to draw conclusions from strategy – performance research in light of the complexity of the phenomena and there is “*little consensus regarding the nature and form of the association*” (Morgan & Strong, 2003, p. 163).

Germany universities have a very high reputation in technological disciplines: however, management education plays a marginal role (Ramirez, 2004).

About 64% of the German top executives in the machinery and equipment sector are engineers and at vice president level, the number is 56%. Around 50% of both populations are mechanical engineers (VDMA, 2007a).

The researcher is keen to understand the state of the executives' education, knowledge and skills regarding strategic management in the machinery and equipment sector, how and where it was acquired and its impact on their management praxis and business.

1.8 Motivation for this research

In order to understand the researcher's motivation it is important to have some information on his background. He started his professional career in 1973 as a mechanical engineer in a company in the machinery and equipment sector. Inspired by business executives, colleagues and the media during his assignment in the United States of America (1984 – 1987), he became interested in general management and strategic management and started to read and collect literature on these topics. Career objectives and the lack of business and management knowledge and skills led him to study again and to obtain degrees in business administration. After these studies, the researcher held a position as vice president of strategic planning and marketing for the Far East in a family owned SME (500 employees) and was president of two subsidiaries (150 employees in Germany and 20 employees in Austria) of a decentralised large Swedish corporation and its English division. His entire professional career as an employee was spent in the machinery and equipment industry sector. At the beginning of 1997, he became self-employed and founded a consulting company specialising in strategic management, restructuring and turnaround of SMEs.

As a consultant and business rating analyst, the researcher visited, analysed and consulted not only a large number of SMEs, but also LSEs in Germany. The spectrum of these

companies ranges from SMEs with 10 employees to very large multinational corporations in different industry sectors such as machinery and equipment, automotive, food, paper products and logistics. He worked with very successful companies, but also in enterprises, who were either near to insolvency or were already insolvent or were in the post-insolvency period. He has seen companies employing sophisticated strategic management procedures, but also enterprises with really poor management practices.

The researcher's experiences, based upon about 40 consulting or rating projects in Germany, are similar to the results of empirical studies:

- The degree and sophistication of strategic management is related to the size of the company (Geiser, 1983).
- Success is related to management practice (Becker et al., 2006; Schmidt & Freund, 1989).
- Management practices and decisions are often inconsistent. An integrated or holistic view is lacking.
- There is lack of operative and strategic planning and controlling (Hammer, 1990; KFW, 2004; Menke et al., 1996).
- Companies often are not or not fully aware of what is happening in their external business environment (Kriegbaum, 1995a; BDU, 2005).
- There is lack of follow up and follow through on objectives, strategies and action items (Waldmann & Wagner, 2003; Kaplan and Norton, 2006).
- Managers with an engineering background tend to concentrate on products and their innovation and give little attention to strategic management (Horváth & Weber, 1990; Wossidlo, 1990).

There were always questions which remained with the researcher after visiting or analysing a company. e.g.: why are the managers not applying strategic management? Are they not aware of the benefits of strategic management? What about their knowledge and skills in strategic management?

To follow up and complement the experiences he had as a self-employed consultant, he decided to find the answers in an academic research project.

1.9 Overall objectives of the research project

The overall objective (Figure 1.2) of the researcher is to contribute to academic society by continuing research on the relation of strategic management with performance and, in addition, to advance knowledge regarding the impact of management education upon strategic practice and performance.

The researcher, who has worked for almost twenty-five years in the machinery and equipment sector in Austria, England, Germany and the USA, wishes to make a specific

academic contribution to this sector, which will be accomplished by exploring and advancing the state of education in strategic management.

Specific research objectives are described in section 6.2.2.

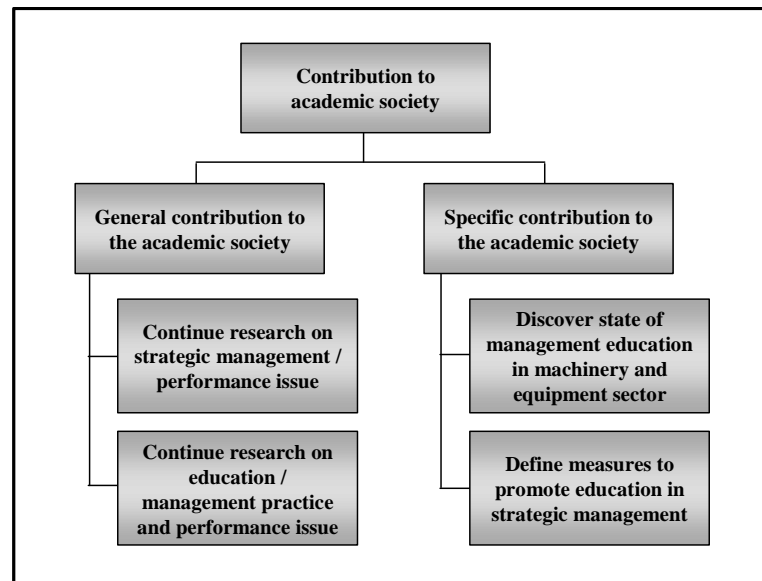


Figure 1.2: The researcher's overall objectives

Source: Developed by researcher

1.10 Structure of the thesis

Basically, this thesis is structured into three main themes: the first consists of desk research and the literature review which describe the research problem and discuss and build its theory; the second consists of field research which describes the methodology and the process of research; and the third evaluates, analyses and concludes the research findings, in addition to providing recommendations.

These themes are integrated in the following chapters:

1. Introduction to the research project
2. Defining strategic management
3. The SME community and research sector; status and challenges
4. Previously published research results and empirical studies regarding the German SME community and research sector
5. The state, practice and impact of management education
6. Research design and processes
7. Research data documentation, analysis and evaluation
8. Conclusions, recommendations and opportunities for further research

1.11 Chapter Summary

This chapter has briefly introduced strategic management and strategic planning. Some have criticised these tools (Mintzberg, 1994; Vasconcellos e Sá, 1989) but one could argue that the tools are not in question, but the level of education, knowledge and skills about them. The chapter goes on to introduce the SME community in Europe and Germany and describes the peculiarities of the German Mittelstand. In addition, existing empirical studies regarding strategic management in SMEs are introduced, followed by the introduction of the research sector machinery and equipment. The accomplishments and future challenges of this sector are described. Most of the managers of enterprises in this sector are engineers who receive little or no education in strategic management at German universities.

The chapter goes on to describe the researcher's motivation and overall objectives of this research project.

The researcher is keen to understand the state of the executives' education, knowledge and skills regarding strategic management; how and where it was acquired; and the impact on their management praxis and business.

Figure 1.3 summarises the issues and conclusions drawn, the contribution to the research project made with this chapter, the knowledge gaps identified and research questions arising.

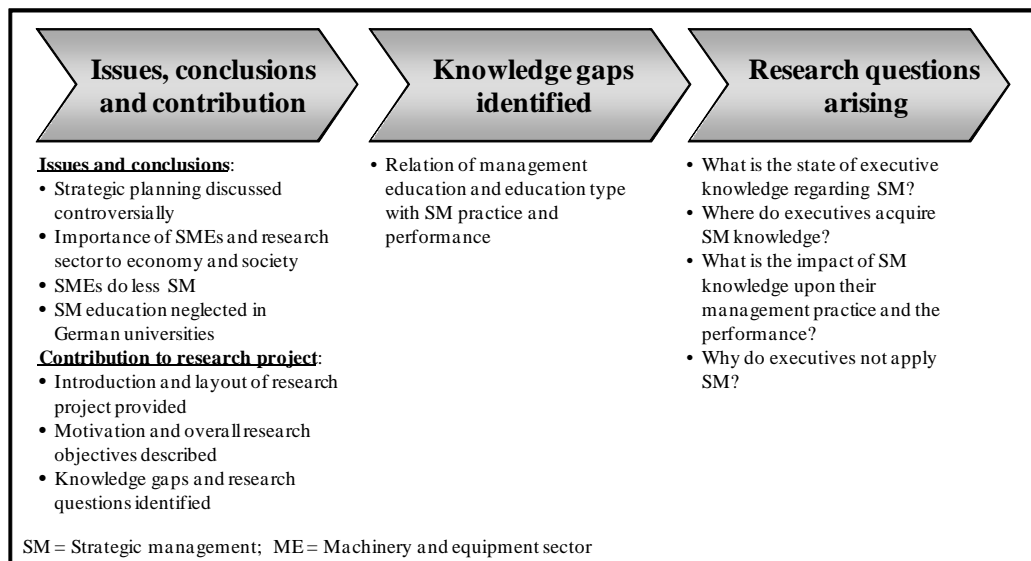


Figure 1.3: Chapter contribution and summary

Source: Developed by researcher

The next chapter describes and discusses in detail the history and state of strategic management and defines a selection of management tools representing the strategic management process and to be used in the field research.

2 Defining strategic management

“The strategy has to join the campaign, to arrange the detail at the spot and for the modification of the whole, which is continuously necessary. It cannot let off from the works for a single moment.”

Carl Philipp Gottfried von Clausewitz (Quoted in Handelsblatt, 2005, p. 75)

2.1 Introduction

Chapter 1 provided an introduction to the research project with a brief discussion of the topics and issues as well as statements about the motivation and overall objectives for this research project.

Figure 2.0 list the objectives for this chapter.

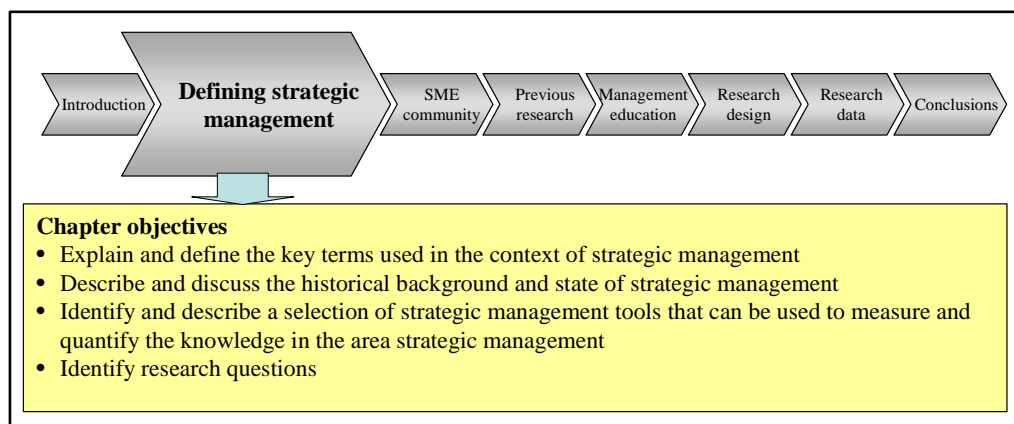


Figure 2.0: Objectives chapter 2

Source: Developed by researcher

This chapter will continue to provide a historical review and discussion of the state of strategic management based upon a comprehensive literature review (Figure 2.0). Throughout this chapter, relevant key terms in the context of strategic management are explained and defined. The research questions that already arose in chapter 1, with regard to knowledge about strategic management and its relation to performance, require the definition of a set of strategic management tools. These strategic management tools are representative of the strategic management process and will later be used to measure and quantify the scope of strategic management knowledge.

2.2 Basics and definitions

Many concepts, strategies, models and phrases have been introduced in the course of time to the business community by management scientists, enterprise leaders and consultants. This section defines and describes key phases in management, their history and use in businesses.

2.2.1 What is management?

The term “Management”, has been derived from the Latin words “manus” (hand) or “manum agere” (lead by the hand) respectively the Italian word “managgiare” (to handle) (Meyers, 1990). Some derive management from the old French word “ménagement”. Webster’s dictionary defines management as “*the act, art, or manner of managing, handling, controlling, directing, etc*”. (Webster, 1983, p. 1093).

Gabler Wirtschaftslexikon (a German business lexikon) describes the Anglo American word management in the economic context as a term for the leading, directing of an enterprise, business, or company. Management can be seen as an **institution**, comprising of all persons (managers) that have leading functions in an enterprise. The management or managers represent the interests of the enterprise internally and externally. Management is also described as a **function**, carried out by the manager in the different areas of a company. This can be operations management, human resource management, marketing management, financial management, etc. Furthermore, management can also be characterised as a **method, technique, concept, or process** to lead or improve functions in an enterprise such as change management (Gabler, 2005).

Davis and Filley (1962) describe and classify management in more detail. However, they fail to describe management as a method or technique. Like Gabler, they do not consider the strategic dimension of management:

- Management as a position:
 - The administrative position at the company’s top level: The top executives set paramount objectives for the company and are concerned with the strategies, direction and overall performance.
 - The operative position: In the operative position are the first level supervisors. They are mostly concerned with the accomplishment of operative objectives such as meeting a certain delivery deadline.
 - The middle management position: The middle management position is the link between the top management and the first level management. Depending upon the size of the company, these managers are concerned with administrative and operative tasks. They set objectives for their area of action in line with the paramount top objectives, plan, organise and control.
- Management as a job, activity or process
 - Decision making: Every manager makes decisions on a daily basis within his scope of responsibility. The ability to make the right decisions, especially decisions which favour the company’s interests on a short term and long term perspective, is one of the most important requisites of management.
 - Coordinating thought and action: Coordination takes place up and down the hierarchical levels, sideways on the same level, between people, projects,

tasks, resources, etc. The aim is to streamline the activities, to avoid redundant work and the waste of time and money.

- Planning, organising and controlling: Here, decisions start to be accomplished by planning e.g. resources, time, capacity, budget. Managers organise and recruit staff, apply for funds, etc. A part of the controlling process is to take corrective measures, if deviations from the objective or planning figures are imminent.

In German academic society, as well as in the business world, the term management is used as a synonym for “Unternehmensfuehrung” (literally translated: enterprise leading). Hummel und Zander (2002, p. 1) characterise “*Management / Unternehmensfuehrung as the target orientated structuring and direction of all decisions in the socio technological system enterprise (Unternehmung)*”. They distinguish between management as a task orientated function and management as a person orientated institution, but fail to explain management as a technique and to consider the strategic dimension.

As depicted in Figure 2.1, Schubert (1972) depicts these phases or management tasks in a management circle. Management will set objectives, plan and realise tasks and will afterwards check to see whether the objectives have been reached. This is an iterative process. It is important, in all phases, to maintain communication to all participants of the management process. This model, still used in current literature, strongly simplifies management. It introduces the iterative approach, but fails to consider the strategic aspect.

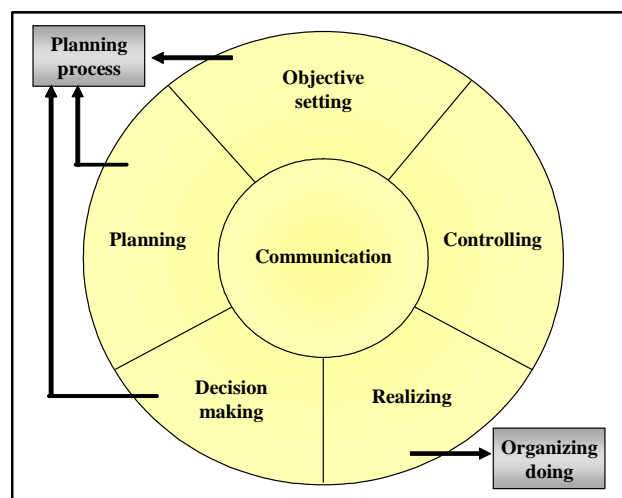


Figure 2.1: Management circle

Source: Schubert (1972)

In their publication “Unternehmensfuehrung” (management) Olfert and Pischulti (1999) characterise management decisions, describe the management function and suggest strategic planning.

2.2.2 The history of management

The art of management is about 140 million years old. A strange hypothesis! But, look at those marvellous tiny creatures, the ants. They survived on Planet Earth for more than 140

million years. Throughout millions of years, they diversified to about 12,000 known species and their population is now estimated at ten thousand trillion (10^{16}). They live anywhere on earth, except on icy mountains and on the poles (Wilson, 2006). Ants are masters of management. They decide, plan and act, coordinate, cooperate and communicate with each other, help and respect each other, have hierarchical structures, introduced division of labour and teamwork long before the human race did. Ants live in a social system and go to war to preserve their colony if necessary (Wilson, 2006).

Mankind's origins go back for a million years, but millenniums passed before our ancestors developed management skills. The first human beings were hunter-gatherers only. About 10,000 years ago, our ancestors started to utilise the land, planted vegetables and fruits, raised animals and began with agriculture (Cordaux, 2006). They started to plan and organise food resources and developed tools for planting, harvesting and hunting.

Throughout the centuries, the ancient people developed skills to melt copper, bronze and iron, to craft tools and weapons, to produce ceramic devices and build houses. Modern civilisations developed in China, Greece and Egypt: the ancient Egyptians planned, developed and built the famous pyramids at Giza between 2,580 and 2,500 B.C., masterpieces mankind still admires today (Citysam, 2006; Meyers, 1990). They successfully managed people, supply chains of material and other resources to build these pyramids and other buildings at this site. The art of management is not an invention of management scientists of modern times. It was already successfully applied by our ancient ancestors.

In the 19th century, industrialisation began in Britain. Craftsmen and entrepreneurs started the first manufacturing organisation and social scientists began to research the “new” area of expertise “Management”.

Economists, such as Adam Smith (1723 – 1790) set the ground work for modern management. Smith studied from 1737 until 1740 at Glasgow University and in 1751, became its Professor for Logic and Moral Philosophy (Weltchronik, 2006). In 1776, he published “An Inquiry into the Nature and Cause of the Wealth of Nations” which some call “the bible of capitalism” (Smith, 1776).

Babbage (1882) published his book “On the Economy of Machinery and Manufactures”. He describes the state and advantages of machinery and manufacture and its benefits to society, the different processes, cost, price, tax and human resource issues, as well as process costs and improvements. Long before Taylor (1911) did, Babbage also discusses and promotes the division of labour in the manufacturing plant. He states (Babbage, 1882, p. 131): “*Perhaps the most important principle on which the economy of a manufacture depends, is the division of labour amongst the persons who perform the work*”. His book is one of the first publications on management, although the word “management” does not appear in it.

Taylor (1911), often called as the father of manufacturing organisation, published the book “The Principles of Scientific Management”. The term “Taylorism” is derived from his

name. Basic characteristics of Taylorism are the improvement of efficiency and productivity of human labour and the division of labour (Gabler, 2005).

Until the early 1960s, the word management did not yet play an important role in Germany's society. A glance in Germany's popular Fackel-Lexikon, 13th edition (1962) revealed that the word management is not listed at all. Manager is listed with the following description: "*Leader of a governmental or private enterprise without owning it*". Furthermore, "Managerkrankheit" (manager sickness) is listed with the following explanation: "*Term for the stimulus of the vegetative nerve system, stemming from an overstrained life style, observed especially in males in a leading position (manager); may lead to sudden cardioplegia*" (Fackel, 1962, p. 492).

Hopfenbeck summarises and characterises the management approaches in the modern times in three periods (Hopfenbeck, 1990):

(1) Traditional, mechanistic, technological approaches 1900 – 1930

In this period, the major contributors were e.g. Taylor, Henri Fayol (Administration Industrielle et Générale 1916) and Henry Ford who introduced line mass production of automobiles.

(2) Sociological, humanistic approach until 1930 – 1960

During this time, Elton Mayo (The Human Problems of an Industrialised Civilization, 1933) researched human relations; Abraham Maslow (Motivation and Personality, 1954) developed the theory of human motivation based on a hierarchy of seven sets of needs; Frederick Herzberg (Motivation Hygiene Theory, 1959), had an immense impact on management thought; and Douglas McGregor presented his assumptions about human behaviour and human motivation, (Theory X and Theory Y, 1960).

(3) Modern management approaches 1960 –

Peter Drucker, who is one of the most important contributors to management science, in the opinion of experts, published more than thirty books since "The Practice of Management", 1954; Igor Ansoff (From Strategic Planning to Strategic Management, 1975) was considered to be a major contributor to strategic planning; Henry Mintzberg (Power in and Around Organizations, 1983) dealt with strategy formulation and business planning and has been extremely influential; Philip Kotler (Marketing Management and Strategy, 1983) is an expert on market strategy; Michael Porter (Competitive Advantage, 1985) an expert in competitive advantage is not only rated highly by fellow academics, but also by practicing managers.

Figure 2.2 depicts a selection of management theories, models, concepts and tools that were introduced in the three periods described above (Wagner, 2001). New manufacturing systems and tools in the 1970s and 1980s such as CAM (computer aided manufacturing) (Spur, 1991) have led to substantial increases in productivity. From the 1970s onwards, numerous management models and tools have been introduced by management scientists. In the early 1980s, the so called "management by" methods were created by economic scientists or business consultants. The most important "management-by" methods are

management by objectives, delegation, exception, or participation (Gabler, 2005; Woehe & Doering, 2002). These early management methods were derived from experience, are practically orientated and easy to apply; however, they oversimplified and, to some extent, polarised management. This wave of methods ended in the late 1980s when the business community began to joke about the management-by methods, e.g. “management by hippopotamus – the water up to its head, but having a big mouth” (Wagner, 2001). Management tools developed and introduced from the mid 1980s onwards are e.g. lean production (Womack et al., 1992), change management (Dalziel & Schoonover, 1988) and the balanced scorecard (Kaplan & Norton, 1996).

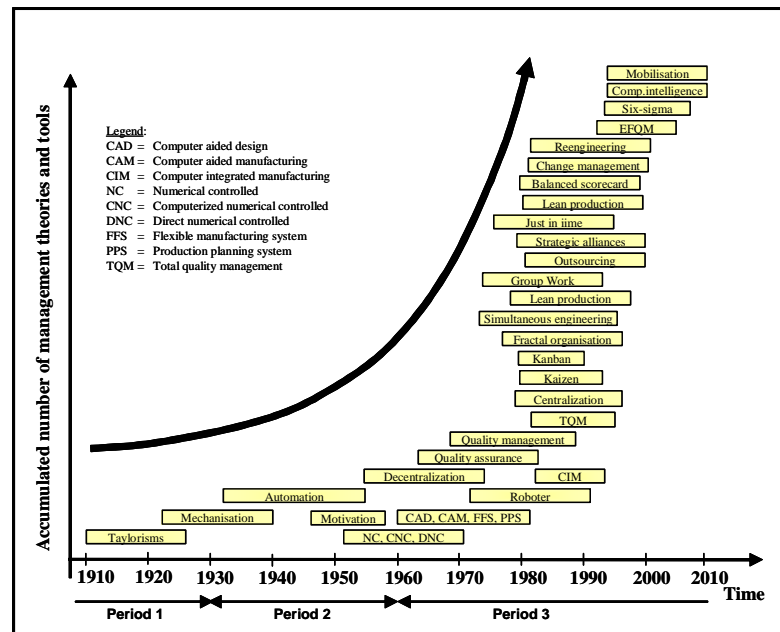


Figure 2.2: Management theories and tools

Source: Wagner (2001)

Today, to some extent, companies are confused by the growth of management practices, models and instruments. Management scientists, business schools and consultants praise and recommend their models or tools as important for the future success of an enterprise. Koontz calls it “*the management theory jungle*” (Koontz and Weihrich, 1988, p. 658). Too many theories, some of which may differ and some of which may be controversial, confuse the business community. Companies were convincingly persuaded to diversify and later told to concentrate on their key business. Companies outsourced IT and later insourced it again.

Some companies had an unfortunate experience with the implementation of management methods such as “change management” as they attempted to alter the behaviour of their employees without improvements to their own leadership styles and they also failed in communication and in the application of their values and culture (Vollrath, 1999).

2.2.3 Management versus leadership

Webster (1983, p. 1030) defines leadership as “*the position or guidance of a leader and the ability to lead*”. If management is considered in the human resource management

context, the dimension of a task, process, or behaviour, it is often compared with leadership. Tannenbaum and Schmidt (1973) discuss and describe different leadership styles or behaviours (Figure 2.3). The researcher considers that this range of leadership styles is still valid and applicable today. However, employees in today's business environment expect a maximum of freedom (Covey, 2009).

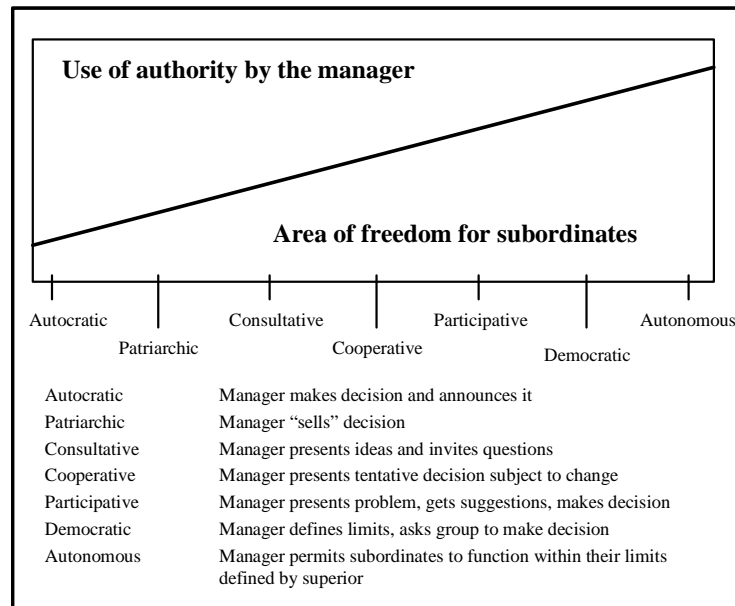


Figure 2.3: Leadership styles

Source: Tannenbaum and Schmidt (1973), amended by the researcher

The researcher agrees with Hinterhuber & Krauthammer (1999, p. 39) who consider "leadership is much more than only management" as they state:

- "Leadership discovers and realises new opportunities; management is creative solution of problems.
- Leadership creates new paradigms; management works within existing paradigms.
- Leadership prepares for the future; management optimises the existing state of affairs.
- Leadership means encouraging change and inspiring the reach for extraordinary objectives; management approach is incremental and a question of methods and techniques."

The researcher would add:

- Leadership empowers employees, creates self-dynamic and pull; management is dynamic and creates push.

Mintzberg (2005) argues that the differentiation between leadership and management should be abolished. The researcher agrees to some extent. There should be no polarisation in leaders and managers, but the reality in the business world is different. The researcher also agrees with Mintzberg's suggestion of involving the employees in the selection process of their superiors and top executives (Mintzberg, 2005).

2.2.4 What is a strategy?

The word strategy and the adjective strategic are derived from the Greek word strategos, (στρατηγός). This word originates in the Byzantine Empire, of the late third century A.D. (Meyers, 1990). It describes a military governor or a leader with financial and judicial responsibilities (PBW, 2007). In the modern Hellenic army today, strategos is the highest officer rank (Mouratidis, 2007).

Webster's Dictionary defines strategy as follows (Webster, 1983, p. 1799):

- *“The science of planning and directing large scale military operations, specifically (as distinguished from tactics), of manoeuvring forces into the most advantageous position prior to actual engagement with the enemy.*
- *A plan or action based on this.*
- *Skill in managing or planning, especially by using stratagems”.*

A stratagem, also called strategem or stratagema (στρατήγημα) is defined as a devise or act of a general (strategos).

Meyers Lexikon provides a general definition of a strategy which can be applied to all areas in which strategies are adopted: *“The layout and realisation of an overall concept in which the acting person or organisation in the competition with others tries to reach a certain goal”* (Meyers, 1990, p. 172). Strategy is also often defined as an overall plan of action to reach a certain objective.

The term “tactic”, which is more commonly used in the plural “tactics”, relates to strategy and is also derived from classical Greek language (taktike, τακτική) (Meyers, 1990). (Taktikos i.e. fit for arranging and also taktos i.e. ordered, the verbal adjective from tassein i.e. to arrange). It is understood, in a military sense, as the art or science of manoeuvring in the presence of the enemy and, latterly, as the means adopted to achieve an end or procedure with a purpose. Although the term has a military origin, it is commonly used in sport, in communication and negotiation and in the business world in its latter meaning. In business, a tactical move might be a price reduction in a certain product range to gain market share in a specific market i.e. the underlying market strategy is market penetration in that particular market and price reduction a tactical move to gain it (Meyers, 1990).

2.2.4.1 Strategies in the military and political environment

As indicated above, the term strategy was derived from the military and used in this sphere in the art of warfare from the third century A.D. until the middle of the twentieth century. Strategy has its root in ancient Greece: however, other highly developed civilisations have created their own theories and tools for strategic behaviour and warfare. In China, Master Sun (Sun Zi), who was reported to be a contemporary of Confucius (551 – 479 B.C.), describes the art of conventional and non-conventional warfare. By non-conventional warfare, tricks and fallacies are meant. Based on Master Sun's wisdom and throughout the centuries the so called thirty six stratagems have been developed (Senger, 2004). During

Mao Tse Tung's administration the thirty six stratagems were declared secret and their publication was forbidden and culpable (Lehmann, 2006). Meanwhile, more than fifty Chinese books deal with stratagems in the business world with aggressive titles such as "Thirty six Stratagems and Economic War" or moderate titles such as "Thirty six Stratagems and Corporate Management". In all of these publications, the military influence on economics and management is noticeable. To date, none of these books have been translated into Western languages (Senger, 2004). The stratagems were introduced in the late 1980s in Europe especially through Senger's publications. Originally, stratagems are war tricks, but they are also instructions: how to cope with difficult situations and with opponents, as well as containing general wisdom. The Chinese letter describing stratagems, as depicted in Figure 2.4, expresses both, wisdom and trick. A Chinese description of trick is called "Chu qi zhi sheng" meaning "create something special to gain a victory". Being sly is considered as being bright and knowledgeable. Being blind to tricks is considered foolish and is subject to ridicule (Senger, 2006).



Figure 2.4: Wisdom and trick (zhi)

Source: Senger (2006)

Throughout history, military commanders and politicians in every civilization have described and applied military stratagems. One of the main founders of modern political science, the Florentine Niccolo Machiavelli (1469 – 1527) reviews the strategy of the ancient military commanders in the only book published in his life time "The Art of War" (Dell'arte della guerra, 1520) in which he also recommends guidelines and stratagems for waging war, but he does not use the words "strategy" or "stratagem", but phrases such as "the art of war" (Machiavelli, 1520).

In the early nineteenth century, Carl Philipp Gottfried von Clausewitz, a Prussian general and military theoretician (1780 – 1831) wrote "On War" (Vom Kriege) published in four volumes in 1832 (it was first translated in 1874 by Colonel L.L. Graham). Read throughout the world, Clausewitz's comments and recommendations on war stratagems and strategies substantially influenced military science in many countries (Meyers, 1990). Often cited, Clausewitz's (1832, p. 13) statement: "*War is only a continuation of state policy by other means*" is well known. In Book three, chapter I, "Strategy", Clausewitz (1832, p. 122) argues for alignment and integration of strategies by stating: "*Strategy is the employment of the battle to gain the end of the War; it must therefore give an aim to the whole military action, which must be in accordance with the object of the War; in*

other words, strategy forms the plan of the War". In Book three, chapter II, "Elements of Strategy", he states (p. 129): *"The causes which condition the use of the combat in strategy may be easily divided into elements of different kinds, such as the moral, physical, mathematical, geographical and statistical elements"*. This implies that paramount strategies can be divided into sub-strategies. In the business context that would mean a corporate strategy is divided into sub-strategies such as marketing strategy, finance strategy, etc. In chapter X, "Stratagem", he states (p. 148): *"Stratagem implies a concealed intention and therefore is opposed to straightforward dealing ..."*. Carl von Clausewitz can be called the father of strategy, strategic thinking and strategic behaviour.

2.2.4.2 Strategies in the business environment

In the 1950 and 1960, from the Anglo-American side, strategies, strategic thinking and strategic planning were introduced in the science of economy and management by a number of management scientists and management gurus. The theories and ideas from the military area were abstracted to the business world and further developed and refined.

The "Harvard Business Review" was first published in 1922 and contained its first strategic planning article in 1938. The title was "Strategy in Industrial Location" by Mears (1938) and it discusses the importance of business planning and techniques with respect to industrial locations. The supplier base, availability of energy and human resources, markets and capital were identified as major influencing factors. Relating to strategy he states Mears (1938, p. 13): *"The objective to start a new enterprise in the best possible spot, having in mind economy and efficiency; or is it designed to absorb and idle population, hence a social problem, or is the main consideration that of military defence, namely strategic?"* and further on *"in Germany for some time the strategic as well as the economic phases have received most careful consideration. As never before, the staffs of the war and naval departments are consulted about all important matters, foremost of which is the strategy of"*. Mears (1938) considers the terms strategic and strategy still in the military context, although he calls his article strategy in industrial locations. But, he considers the military aspect as one factor of selecting a plant location.

Cyril and Magee (1953, p. 112) state in their paper "Operations Research for Management": *"The future holds possible extensions such as the development of strategic concepts through the application of the much heralded (but as yet largely untested) theory of games ..."*. Cyril and Magee introduce the theory of games to the science of management.

Shubik (1955, p. 40), in his paper "The Uses of Game Theory in Management Science" defines game theory and sets the military situation in context with the business situation: *".. a method for the study of decision making in situation of conflict. It deals with problems in which the individual decision maker is not in complete control of the factors influencing the outcome. A general whose forces face the enemy, an industrialist are all involved in the struggles which we may classify as game situation. A strategy in war or*

in business is the same. It is a general plan of action, containing instructions as to what to do in every contingency.”

Two years later, Payne (1957) describes in a “Harvard Business Review” article the steps and tasks in long range planning for businesses. He uses the term “strategy” in the context of increasing complexity in marketing and production.

In his paper “Strategies for Diversification” Ansoff (1957) describes criteria, methods and strategies for product-market alternatives such as market penetration, market development, product development and diversification. In his twelve page article, the term “strategy” appears 45 times. At this time, the term strategy began to conquer the world of business and management.

Figure 2.5 demonstrates the growth of articles published in the “Harvard Business Review” from 1922 to 2000 containing the key word “strategic planning” (EBSCO, 2006).

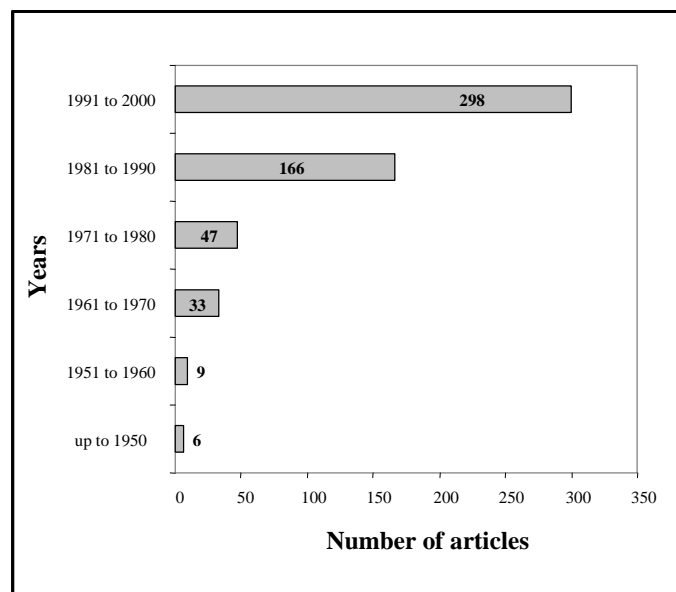


Figure 2.5: Articles containing key word “strategic planning”

Source: EBSCO (2006)

It is obvious that the breakthrough in strategic planning in the world of businesses and economic came in the early 1980s.

Chandler (1962, p. 39) states that the determination of the structure of a company shall follow the selected strategy. He defines strategy as:

- The determination of long-range objectives and tasks of an enterprise.
- The determination of a plan for the further action and allocation of resources, which are necessary for the realisation of the objectives.

Peters (1984, p. 111) suggest the opposite “*strategy follows structure*”. Strategy evolves from inside the organisation and not from the future environment. One could argue that both approaches are too rigid. Both the environment and capabilities and organisation of a business determine the objectives and the strategy and the organisation has to be adapted if necessary to realise the objectives and strategy. As Mintzberg (1996, p. 93) described it “*strategy always precedes structure and always follows it too*”.

Mintzberg (1977, p. 28, 1987, p. 67) defines strategy “as a pattern in a stream of decisions (actions)” and states: “Strategies are both, plans for the future and pattern from the past”. The word “pattern”, in characterising a strategy, can be appreciated as it implies that decisions and actions are to be consistent with and directed to the objectives and strategy, like vectors pointing to them.

Porter (1979) used the structure conduct performance paradigm (SCP) developed for the industry by Bain and Mason (1968) and applied it to the area of business strategies. From that, he derived his concept of the five competitive forces that shape strategy (Figure 2.6). Two basic strategies can be described: the cost leadership strategy and differentiation strategy (Porter, 1979, 1991). With the five forces, still used today in strategy finding, a good part of the external environment can be described, but other forces in the dynamic environment such as associations, opinion leaders, or trend setters are neglected. Recklies (2009) argues that Porter’s model was developed at a time when the markets structures were still relatively stable and that this model cannot explain or analyse today’s dynamic changes. Porter (1991) has recognised this shortfall, argues for a dynamic theory of strategy and recommends research in this area.

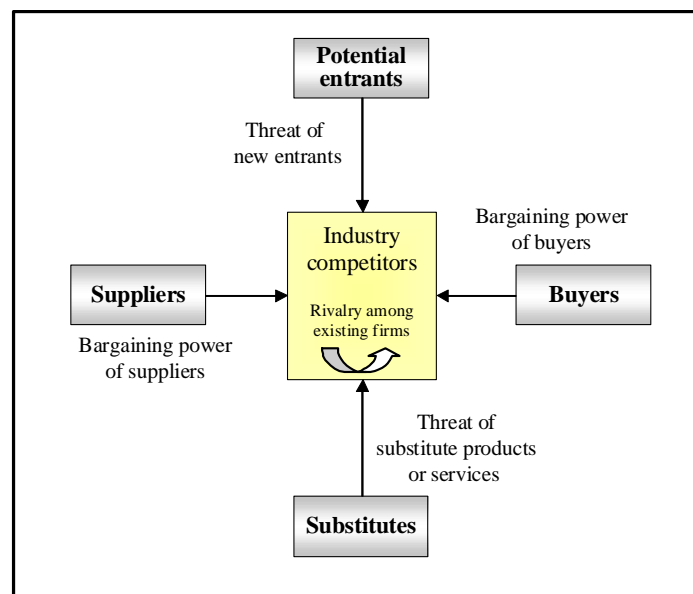


Figure 2.6: The five competitive forces

Source: Porter (1979)

Porter (1996, p. 61) argues that positioning, “*once the heart of strategy, is rejected as too static*”. The researcher agrees and would argue that positioning is an element of a strategy. There is no heart in strategy, but many elements. The position of the company, or the products in the market, has to be assessed and adapted if necessary during the iterative strategic planning process. Furthermore, Porter (1996, p. 64) argues that: “*Competitive strategy is about being different. It means deliberately choosing a different set of activities to deliver an unique mix of value*”. Again, the researcher would agree, but considers differentiation also as an element of strategy.

2.2.4.3 Application of strategies in other areas

Since the 1980s, strategies, strategic thinking and behaviour were abstracted from the military, economic and managerial areas and applied basically to all sciences and other disciplines in life. Engineers plan strategies for the development of new products or processes; architects apply strategies for the design of new buildings; psychologists use certain strategies to help their clients to overcome any psychological obstacles; social scientists use certain strategies for gathering, collecting, evaluating research data; medical doctors apply selected strategies for diagnosis and therapy to help and cure their patients; lawyers take advantage of certain rhetorical strategies (and also stratagems) to win a court case. Leaders in the information technology sector define and communicate the new IT strategy in line with the corporate strategy.

In other areas of life, strategies, strategic thinking and strategic behaviour are also fairly common. In sports and games, the football trainer applies proven training strategies or game strategies and tactics to score goals and to win the game or championship. A trainer for an Olympic team uses strategies for strengthening the physical and mental power of the individual participants. Chess is a typical strategic game. Both opponents apply certain game strategies or stratagems to defeat the other.

Investment banks and brokers have designed certain strategies for investing in companies, stock option, etc., to optimise the profit for investors. There are even financial products such as strategic certificates for investing in certain categories of stocks or bonds which promise a higher yield (Wirtschaftswoche, 2006).

Strategies, strategic thinking and strategic behaviour, as well as stratagems can also be abstracted and applied to an individual's life. For example, a strategy can be developed and applied to gain a desired job or to reach a certain milestone in one's career or other strategic objective in one's life. Parents can apply training and education strategies to guide their children through school and university to give them the best start for their career as professionals. Students can apply a network strategy to find mentors and supporters for their study and afterwards (Wagner, 2001).

The researcher defines terms in strategic management as follows:

Management:

An institution, process and method to direct the business resources.

Strategy:

A strategy is a consistent plan of action directed to the vision and objectives.

Strategic direction:

A paramount strategy selected for a company, directed to the vision and objectives.

Strategic:

The attribute of a plan, way of thinking, or behaviour that meets the characteristics of a strategy.

Strategic thinking:

A mindset / mentality towards applying strategies.

Strategic behaviour:

Acting towards applying strategies.

Stratagem:

A concealed action to reach a certain objective.

Tactic:

An action to support the strategy.

2.2.5 Operations management

Webster's dictionary defines operation as *"the act method and process of operating"* (Webster, 1983, p. 1253). The history of operations management goes hand in hand with the history of management as described above. Schroeder (1989, p. 4) defines operations management as the *"production and supply of goods or services"* and considers it as a functional area next to marketing, finance, personnel, accounting, management information systems and logistics. Other authors include the management of the supply chain with inward bound, internal and outward bound logistics as well as procurement (Schmenner, 1990; Greasley, 2008). Busi & Bititci (2006) add the design of products and services to the scope of operations management.

Himpel & Winter (2008) emphasise the strategic aspect of operations management and define an operations management matrix with a strategic, tactical and operational dimension. Bititci (1995) argues for the integration of operations and shared vision, objectives and strategy. Kaplan & Norton (2008) link strategic management with operations management and state that *"a visionary strategy that is not linked to excellent operations and governance processes cannot be implemented"*. The researcher fully agrees and regards operations management as an integral part of strategic management.

The researcher defines operations management as follows:

Management of the processes related to the manufacture and supply of goods and services along the entire supply chain.

The next section goes on to discuss the importance of strategic management.

2.3 What is strategic management?

Since the 1950s, many management scientists and consultants have developed theories, tools and models for strategic management. This section goes on to introduce, discuss and define strategic management.

Gabler (2005, p. 2843) offers the following definition of strategic management (strategische Fuehrung): *"Processes for planning, realising and controlling of strategies"*. This basic, practical definition is correct, although it ignores strategic thinking as an element of strategic management.

Knyphausen-Aufsess (2006, p. 5527) describes strategic management with three processes:

1. Process of generating and evaluating new ideas
2. Process of integrating resources and activities
3. Process of permanent renovation

Taylor and Machado (2006, p. 139) describe strategic management as a “*holistic process with many components that must effectively interact and function together*” and list several elements such as institutional culture, strategic planning, leadership, financial management and human resource management. With holistic processes interaction they point out important attributes of strategic management, but omit aspects of direction and control.

Mintzberg et al. (1998, p. 5) critically discuss in detail the different approaches to strategic management, the ten schools of strategic management process described by different management scientists (Figure 2.7):

1. The cognitive school: Strategy formation is a mental process; resides in the mindset of a strategist, located at the centre; looks inside the process
2. The positioning school: Strategy formation is an analytical process; looks behind at established data and feeds it to the box of strategy making
3. The planning school: Strategy formation is a formal process; looks slightly ahead to program strategies
4. The design school: Strategy formation is a process of conception; looks farther ahead to strategic perspective
5. The entrepreneurial school: Strategy formation is a visionary process; looks beyond to a unique vision of the future
6. The learning school: Strategy formation is an emergent process; looks below the enmeshed details “into the grass roots”
7. The power school: Strategy formation is a process of negotiation; looks below the enmeshed details “under the rocks”
8. The cultural school: Strategy formation is a collective process; looks down in clouds of belief
9. The environmental school: Strategy formation is a reactive process; looks on, so to speak
10. The configuration school: Strategy formation is a process of transformation; looks all around

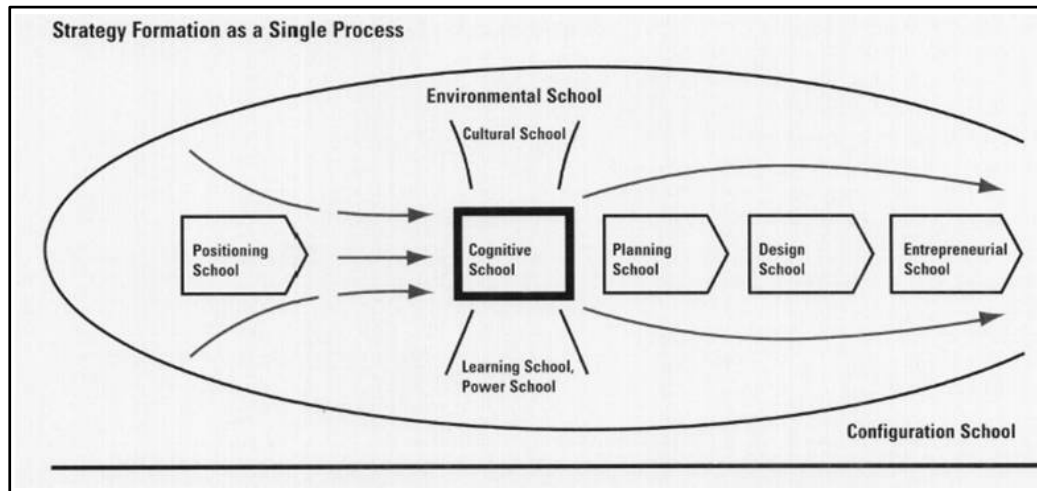


Figure 2.7: The ten schools of strategic management

Source: Mintzberg et al. (1998)

Clegg et al. (2004) stress the epistemological foundation of strategic management and refer to Descartes (1642) who defined the Cartesian split between mind (*res cogitans*) and matter (*res extensa*). Based on this philosophy, Clegg et al. (2004, p. 22) define the seven fallacies of strategic management:

- The gap between managerial fantasy and organisational capabilities
- The gap between actual, clear goals and possible, unpredictable future
- The gap between planning and implementing
- The gap between planned change and emerging evolution
- The gap between means and ends (resources and objectives)
- The gap between planning head (management) and a planned body (organisation)
- The gap between order and disorder

The researcher defines strategic management as follows:

Strategic management is a combination of strategic thinking (mind set) and strategic behaviour (process). The latter consist of strategic planning, strategy execution and controlling.

The next section goes on to discuss strategic planning.

2.4 Strategic planning

Strategic planning is an important key element of strategic management and, often, is used in business praxis as a synonym for it. Strategic planning deals with the future, sets objectives and direction, but it is also based upon the current situation and the past (Mintzberg, 1987).

Drucker (1985, p. 121, 125) introduces the features of strategic planning and cites: *“Management has no choice but to anticipate the future, to attempt to mold it and to balance short-range and long-range goals”*. *“Strategic planning is ...:*

- *analytical thinking and commitment of resources to action*
- *necessary because we cannot forecast the future*
- *deals with the future outcome of present decisions*
- *to take the right risk and improve entrepreneurial performance*
- *the continuous process of making present entrepreneurial (risk-taking) decisions systematically and with the greatest knowledge of their futurity*
- *organising systematically the efforts needed to carry out these decisions*
- *and measuring the results of these decisions against the expectations through organised systematic feedback”*

Drucker (1985) provides a comprehensive definition of strategic planning with the continuous element but does not integrate the past and current situation.

Mintzberg (1994a, pp. 7-12) describes planning as:

- *“Planning is future thinking; take the future in account*
- *Planning is controlling the future; thinking about it and acting on it*
- *Planning is decision making*
- *Planning is integrated decision making; dealing with interrelationships among decisions*
- *Planning is a formalized procedure to produce an articulated result, in form of an integrated system of decisions”*

Although Mintzberg (1994a) has mentioned the consideration of the past, he neglects this here. One could argue that planning considers the past (what happened), the present (what is the current situation) and the future (what is to be done).

The value of strategic planning is controversially discussed. Some see it as rituals (Vasconcellos e Sá, 1989). If companies fail to consider or do not use important elements of strategic planning, it is seen as a paper exercise (O'Regan & Ghobadian, 2007). This implies that the quality of strategic planning depends upon the skills in strategic management.

Mintzberg (1994a) identifies fundamental fallacies of strategic planning:

- The fallacy of predetermination; the limited value of forecasting techniques
- The fallacy of detachment; loss of bond to reality
- The fallacy of formalisation; temptation to formalise strategies

Nobody can precisely predict the future. But tools, such as the scenario technique, can make the future more predictable (Gausemeier et al., 1996). Using intuition, “gut feeling”, the sixth sense based upon long experience can help (Miller & Ireland, 2005; Dane & Pratt, 2007). Albert Einstein once stated: *“The really valuable thing is intuition”* (Miller & Ireland, 2005, p. 19). Loss and excessive formalisation are a matter of planning quality and the management skills of the individuals involved.

Mankins & Steele (2006, p. 88) argue that “*in most companies a lot of planning is done and little is decided*”. Instead of an annual strategic planning session, they propose a continuous topic orientated planning. The researcher would propose an iterative planning approach and continuous controlling within the management team in regular meetings. Decisions can be made when necessary and the realisation, success, measured at any time. A planning by topics, e.g. market entry China in January and product introduction in April, may lead to the neglect of interaction and dependencies.

There is a saying: “*The plan is always wrong*”. Preparing a strategic plan in October for the coming year and forgetting about it, as some companies do, is not the right process. Due to an unexpected event in the external or internal environment shortly after the planning period, the plan may be completely obsolete and need reworking. Thus strategic planning must be an iterative, ongoing process. The executive and personnel involved in strategic planning must have the required education and skills. Otherwise, strategic planning is not understood and carried out professionally.

Gray (1986, p. 89) argues: “*There’s nothing wrong with formal strategic planning – if you do it right.*” In an empirical study he discovered mistakes made in strategic planning:

- Poor preparation of line managers
- Faulty preparation of business units
- Vaguely formulated goals
- Inadequate information bases for action planning
- Badly handled reviews of business unit plans
- Inadequate linking of strategic planning with other control systems

One could argue that in order to “do it right”, the employees with management positions and those involved in strategic planning must be prepared and skilled.

Kaplan & Beinhocker (2003, p. 71) argue that “*the goal of a strategic planning process should not be to make strategy but to build prepared minds that are capable of making sound strategic decisions*”. Other management scientists argue that creating a strategy is an integral part of the strategic planning process (Steiner, 1979; Akers & Porter, 1995).

Kaplan & Norton (2006) suggest the implementation of a strategy office for the support of strategic planning and strategy execution.

The researcher defines strategic planning as follows:

Strategic planning is the core element of strategic management. It is an iterative ongoing process, consisting of strategic analysis, strategic premises and settings and strategy formulation.

Strategic management and strategic planning are controversially discussed by management scientists. One could argue that the prerequisite to professional, valuable strategic plans, however, are executives and planners with sufficient education and skills in strategic management.

The next section introduces different generic strategy types.

2.5 Generic strategy types

Management scientists, consultants and business leader have developed and tested a variety of generic strategies. The underpinning perspectives for strategies may be a resource-based (Newbert, 2007) or a market-based view (Neuburger & Clemens-Ziegler, 2003). In the following, a selection of generic strategy types is introduced and listed:

- Growth strategy (Bea & Haas, 2005; Pearce & Robinson, 2005)
 - Internal growth
 - External growth; business acquisition
 - Divestment strategy; withdrawal
 - Restructuring and consolidation strategy; e.g. turnaround and consolidation of the financial situation
- Internationalisation strategy (Goetze & Mikus, 1999; Bamberger & Wrona, 2004)
 - Indirect export
 - Franchising, licensing
 - Export through dealers
 - Export through own subsidiary
 - Direct investment; business acquisition; production plan
- Cooperation strategies (on company level but also for all functional areas) (Goetze & Mikus, 1999; Bamberger & Wrona, 2004)
 - Strategic alliance; e.g. with universities, suppliers
 - Participation; e.g. common projects or mutual equity ownership
 - Joint venture; commonly owned company
 - Independence; e.g. refrain from any cooperation if company has leadership
- Integration strategies (Goetze & Mikus, 1999; Wagner, 2001)
 - Forward integration in the supply chain
 - Backward integration in the supply chain
 - Neutral; refrain from integration
- Portfolio strategies (Hax & Majluf, 1983, 1983a; Olfert & Pischulti, 1999; Pearce & Robinson, 2005)
- Marketing strategies (Ansoff, 1965; Porter, 1990, 1991; Goetze & Mikus, 1999; Olfert & Pischulti 1999; Bea & Haas, 2005)
 - Product market strategies
 - Cost leadership strategy

- Segmentation, differentiation, positioning strategy
- Niche strategy
- Attack strategy
- Defence strategy
- Operations strategy (Goetze & Mikus, 1999; Olfert & Pischulti, 1999; Wagner, 2001)
 - Make or buy strategy; outsourcing, insourcing of value chain elements
 - Production nearshoring; e.g. low cost European countries
 - Production offshoring; e.g. Fareast
 - Procurement strategy
- Human resource strategy; e.g. new leadership approach (Wagner, 2001; Bamberger & Wrona, 2004)
- Research and development; e.g. introducing innovation management procedures; technology leadership (Goetze & Mikus, 1999; Olfert & Pischulti, 1999)
- Finance strategy; e.g. increase equity by selling shares to silent partner (Olfert & Pischulti, 1999; Wagner, 2001)
- Controlling strategy; e.g. implementation of a management cockpit (Bea & Haas, 2005; Weissman, 2006a)

Often strategies fail, although appropriate, because they are not clearly communicated and understood by the organisation (Kaplan, 2006), or the strategy is poorly executed (Kaplan & Norton, 2006). Another issue is the excessive optimism which sometimes blinds the executives (Lovallo & Kahneman, 2003). Reinmoeller and Baardwijk (2006) argue for combination of strategies.

There is an impression that management scientists and consultants rival for the “best” strategy and business leaders follow the recommendations made. Daimler, for instance, strongly diversified during the Reuter era (1987 – 1995). Schrempp (1995 – 2005) reversed this by concentrating on the automotive business, divesting non-automotive companies, merging with Chrysler and buying into Mitsubishi. Zetsche, who cleaned up the disaster, restructured and consolidated. In 2006, Daimler had reached its 1987 level, but its assets were stripped and it was highly indebted (Katzensteiner & Rother, 2009).

The next section introduces and discusses strategic management models.

2.6 Strategic management models

Strategic management models were mostly developed by management scientists, economists and business consultants, but some models have also evolved from the quality management side. A selection of management models will be introduced and discussed in the section which follows.

2.6.1 Strategic management models evolved from quality management

The management models evolved from the quality management side have their roots in the late 1950s as the United States of America Department of Defence issued the military specification MIL-Q-9858, “quality program requirements” (Deming 1982; International Standards Organization, 2000; Zink, 1998, 2004). The latest and best known model is the TQM / EFQM excellence model (EFQM, 2003, 2007) depicted in Figure 2.8.

The model, introduced in the mid 1980s, considers so called enablers and results. Enablers are leadership, people, policy and strategy, partnerships and resources, as well as processes. Results are measured in the areas of people (e.g. employee satisfaction), customers (e.g. customer satisfaction), society (e.g. corporate citizenship), as well as key performance indicators. The percentage values assigned to each element represent the weighting in the assessment. It later considers how an enterprise deals with innovation and learning. The EFQM organisation, with its headquarters in Brussels, Belgium and their local offices in most of the European countries, offers seminars, literature, questionnaires and other aids for training and assessment (EFQM, 2003, 2007).

Questionnaires can be used by companies for a self-assessment. A trained employee or an independent consultant can be assigned to carry out the assessment. With this self-assessment process, the management can find out where it stands in the process of creating an excellent company, where the gaps are and which action should be carried out. Furthermore, the management can use the questionnaires and the results for structuring the organisation, for benchmarking, or the preparation for the application for the EQA, the European quality award based upon the TQM / EFQM excellence model (EFQM, 2007). The European quality award was first awarded to an European company in 1992.

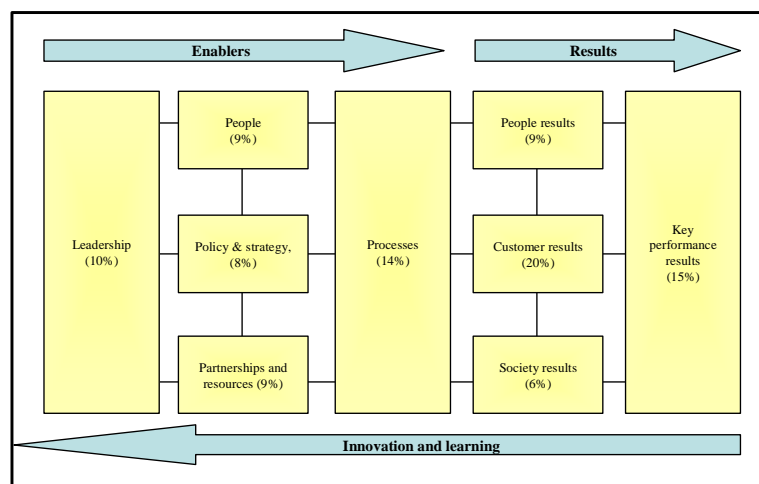


Figure 2.8: The TQM / EFQM excellence model

Source: EFQM (2007)

Kamiske (2006, p. 8) critically argues about the “*Bermuda triangle of TQM*”. For example, companies change the strategic direction too often (constancy of purpose) and confuse the stakeholders; production is transferred to low cost labour countries without

considering facts other than costs; and companies are often inefficient and employ too many people.

2.6.2 Strategic management models evolved from management science

Besides the strategic management model introduced by McCarthy et al. (1975) and briefly discussed in chapter 1 (Figure 1.1), there are many models depicted and described in papers and books. A selection of models will now be introduced and discussed:

Malik (1981, p. 13) defines the basic principles of a praxis-orientated integrated management system as follows:

- Basic principle of holism: All aspects of the business are to be covered, only this approach can cope with the complexity a business is faced with
- Basic principle of multi dimension: Every real system consists of a multitude of dimensions such as social, technological, economic, etc., this principle complements the principle of holism
- Basic principle of integration: All elements of the management systems are to be integrated to a harmonic and functional whole
- Basic principle of modularity: Management systems cannot be realised at once, modularity allows a step by step approach, without compromising the principle of integration
- Basic principle of understandability: Management systems shall not be complex, they shall be easy to understand and easy to apply
- Basic principle of applicability to all levels: Management systems are not a tool for the top management only, management systems are to be flexible and shall be adopted and utilized in all organisational levels of the business

Figure 2.9 depicts Malik's summary of the praxis-orientated integrated management system consisting of the concept of the environment, the concept of the business and the management concept. The concept of the environment is composed of the dimensions ecology, technology, economy, market and the social dimension. Scenarios are used to derive assumptions for the future and to compose the concept. The business concept includes comprehensive management details, regarding objectives, performance potentials and strategies in the economic, financial and social context. The management system, management methods, organisational concepts and the managing personnel form the management concept. Malik (1981) provides a holistic approach to strategic management: however, the iterative approach to planning and controlling is not part of his model.

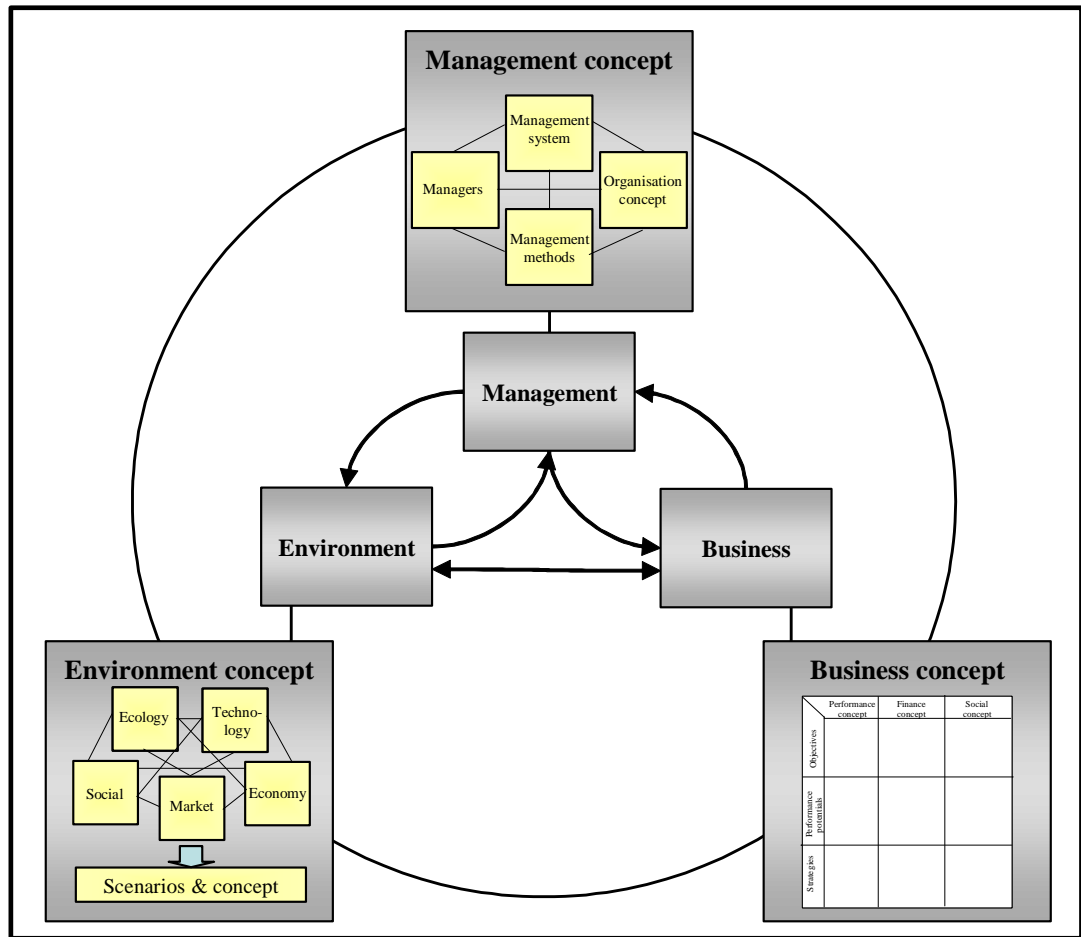


Figure 2.9: Structure of an integrated management system

Source: Malik (1981)

Amann (1995) introduced the model of strategic and operative management as depicted in Figure 2.10. In general, strategic management is carried out prior to operative management. He suggests aligning strategic and operative objectives, concepts and tasks. The basic premises and paramount objectives derived in the strategic planning process are the framework for the operative management. On the other hand, the results from the operative management are used for the next round of strategic planning. The results and effects from both, strategic management and operative management are reviewed by strategic and operative controlling. The results enter the process of defining new or adjusted strategic objectives and operative objectives, as well as definition of new or changes alternatives for the business. Unlike strategic management models, introduced by McCarthy et al. (1975), Koontz & Weihrich (1988) and Mintzberg (1990) that of Aman (1995) sets the objectives prior to the analysis of the environment and internal resources. One could argue that the company needs to know where it is (situation analysis) before it defines where to go (objectives).

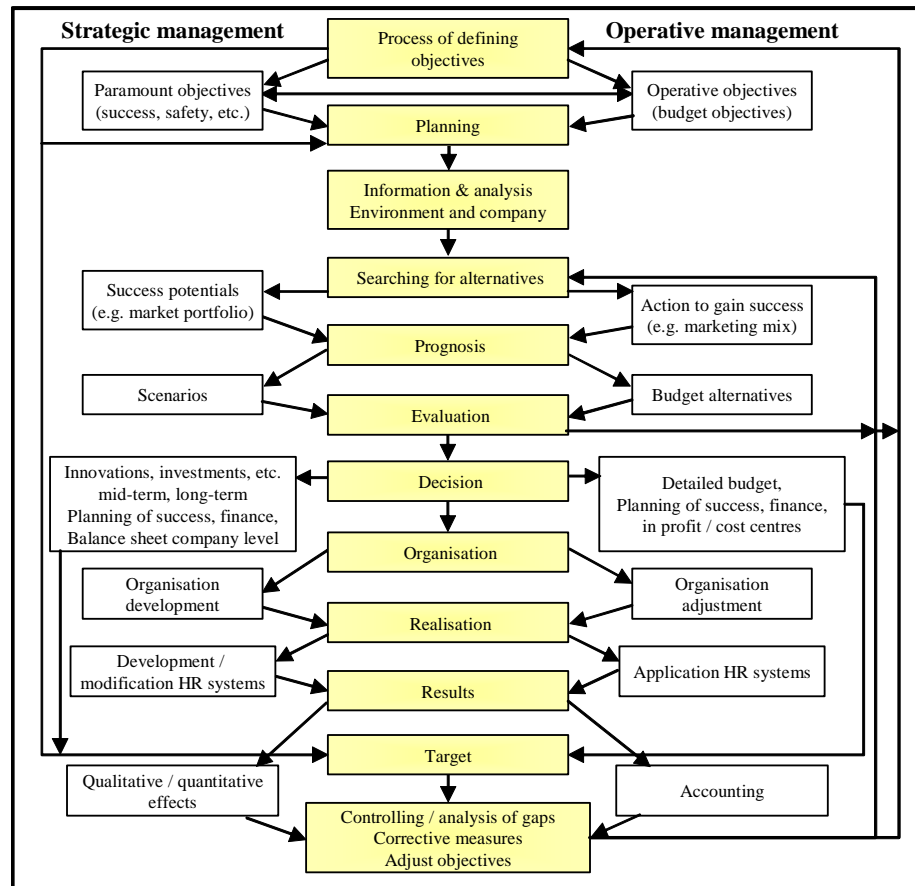


Figure 2.10: The St. Galler management concept

Source: Amann (1995)

Welge & Al-Laham (2003) describe the conception of strategic management (Figure 2.11) consisting of four phases. In phase one, the policy of the business, the mission and strategic objectives are defined. Phase two follows with the strategic analysis and evaluation of the business environment and the business functions. Data from the early warning system is used as input. This adds quality to the assessments and prognoses and minimises the risk of false assumptions for planning. In phase three, strategies are defined top down, from the overall business strategy to strategies in functional areas. Finally, in phase four, the strategies are implemented and realised and planning and budgeting is carried out. With strategic controlling, the comparison of the plan with the actual outcome, data is provided as input for the individual phases of the strategic planning process. As Amann's model, described above, this model sets the phase of strategic analysis after the phase of objective planning.

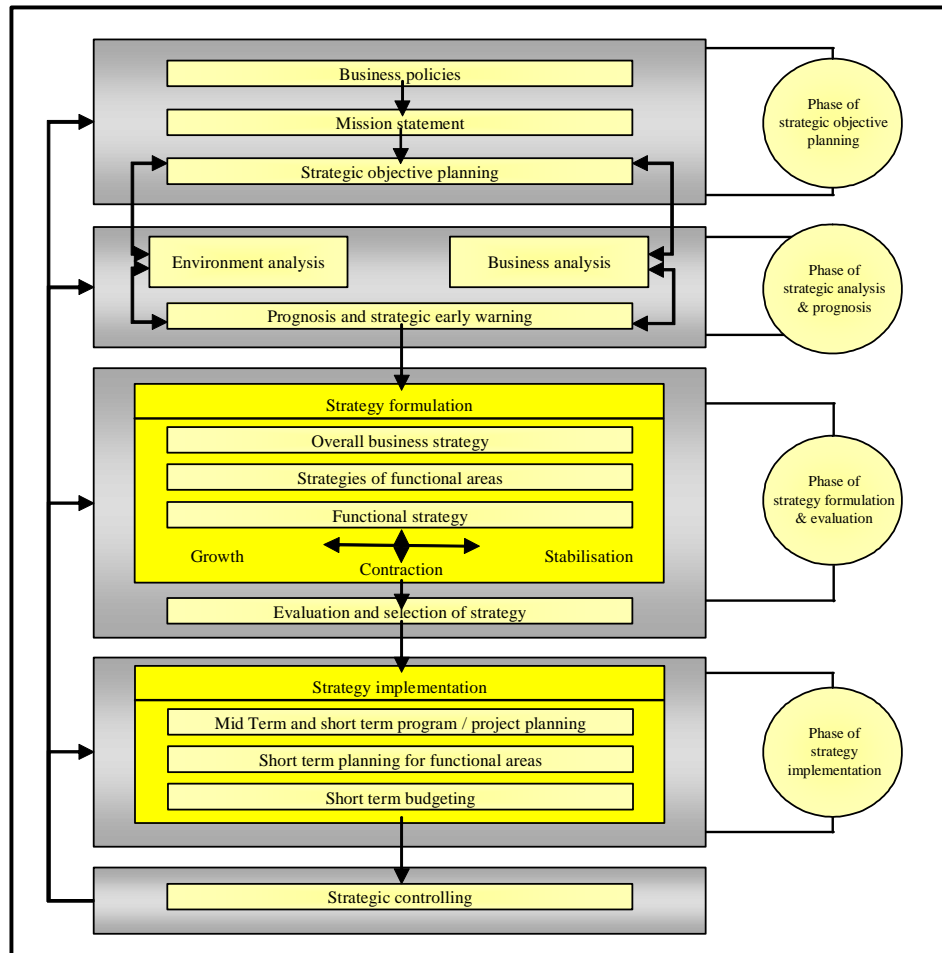


Figure 2.11: Conception of strategic management

Source: Welge & Al-Laham (2003)

In the course of the literature review, further strategic management models were studied:

- (Ulrich & Krieg, 1972); the St. Galler management model: This model introduces the supply chain approach, but neglects the strategic planning process.
- (Koontz & Weihrich, 1988); the systems approach to management: This model describes the strategic management process. Unlike other management scientists, they mention managerial knowledge as a prerequisite.
- (Mintzberg, 1990); the design school of strategic management: This model depicts the strategic planning process, but neglects the iterative approach to strategic planning as well as controlling.
- (Bleicher, 1991); the St. Galler management concept: This model seems to be somewhat abstract for a business practitioner. It does not describe the strategic planning process.
- (Hinterhuber, 1996); the complete system of strategic management: This model emphasises the role of the stakeholders. The external environment and controlling aspect of strategic planning are neglected.

- (Federer & Griglio, 1998); the principle of holistic strategic management: This model emphasises portfolio strategies, but does not depict the elements of strategic planning.
- (Hahn and Taylor, 1999); the concept of strategic management: This model depicts the strategic planning process, but neglects the iterative approach to strategic planning.
- (Ruegg-Stuerm, 2002); the new St. Galler management model: This model advances the one introduced by Ulrich & Krieg (1972). The strategic planning process is not described.
- (Steinle, 2005); the contours of holistic management: This model emphasises business policies and human recourse, but lacks a clear strategic planning process.

The next section describes a list of strategic management tools that will be used to measure the knowledge regarding strategic management in the research sector.

2.7 Strategic management tools

Over time, management scientists and consultants have developed and introduced a large variety of management tools which can be used in management praxis. Not only can management tools be applied in the context of strategic planning, strategy execution and controlling, but also in the functional areas such as operations management, human resource management, marketing, research and development, and finance.

Some publications have concentrated on describing management tools (Kappeller & Mittenhuber, 2003; Wagner, 2007), but to prepare a comprehensive list of management tools for this research project, would be excessive. Kappeller & Mittenhuber (2003) describe 330 management tools which are arranged alphabetically in their publication "Management Konzepte von A bis Z" (Management Concepts from A to Z).

Kaplan & Norton (2008, p. 7) say there is a "myriad of operational management tools" and suggest linking them with strategy. It is for management to decide on the selection of management tools and apply them in context with their strategic management approach.

In order to provide a framework for the empirical work of this research project and for measuring the degree of knowledge and application regarding strategic management, various management tools were listed and clustered (Tables 2.2 and 2.3) throughout the phases of strategic management. These phases, described above in various strategic management models (McCarthy et al., 1975; Welge & Al-Laham, 2003; Wagner 2001) are (Figure 2.12): strategic analysis; strategic premises and settings; formulation of paramount strategies (strategic direction); business strategies for the functional areas (operations management, HR, marketing, R&D, finance); strategy execution and controlling.

The management tools used in the questionnaire and data analysis were selected according to the following criteria:

1. Tools for all phases of strategic management

2. A minimum of two and maximum of five tools per phase or functional area
3. A mixture of allegedly well known to less common tools
4. Strong strategic relevance
5. Relevance for the machinery and equipment sector
6. Maximum 30 ± 2 management tools (time limit 15 minutes for questionnaire)

A final number of 31 management tools were selected (Figure 2.12) and listed in the survey questionnaire. In the empirical part of this research project the rate of knowledge and application of the selected 31 management tools and their relation to the type of education, age, seniority and company performance are analysed and evaluated.

The researcher defines management terms as follows:

Management tool:

An instrument, procedure or method to support the management praxis

Strategic management tool:

A management tool with strategic relevance used to support the phases of strategic management

Management tool	Mainly used in									Reverences	Selected
	Strat. analy.	Strat. prem.	Strat. form.	Strategies in functional areas					Strat. exec., control.		
				Oper.	HR	Mktg.	R & D	Finan.			
Benchmarking	X									Mertins et al. 1995; Michaeli 2006	✓
Best practice analysis	X									Wagner 2007	
Competitive intelligence	X									Michaeli 2006	
Cross impact matrix	X									Michaeli 2006	
Due diligence	X									Kappeller & Mittenhuber 2003	
Event modelling	X									Michaeli 2006	
Five competitive forces	X									Porter 1979, 1991	✓
PEST workshop (politics, economy, society, technology)	X									Michaeli 2006	
Scenario technique	X									Gausemeier et al. 1996	✓
SWOT	X									Pearce & Robinson 2005; Wagner 2007	✓
Trend scouting	X									Michaeli 2006	
Corporate identity programme		X								Bamberger & Wrona 2004; Wagner 2007	✓
Mission statement		X								Pearce & Robinson 2005; Wagner 2007	✓
Sytem of objectives		X								Wagner 2007	
Values and ethical guidelines		X								Wagner 2007	
Vision		X								Pearce & Robinson 2005; Wagner 2007	✓
Attractiveness-business-strengths matrix			X							Hax & Majluf 1983; Pearce & Robinson 2005	✓
BCG growth-share matrix			X							Hax & Majluf 1983; Pearce & Robinson 2005	✓
Blue ocean strategy			X							Kim & Mauborgne 2005	
Market-life-cycle-competitive-strength matrix			X							Pearce & Robinson 2005	✓
Product market grid			X							Ansoff 1965	✓
Strategic alliance			X							Kappeller & Mittenhuber 2003	
Strategy maps			X							Kaplan & Norton 2004	✓
5-S-principle				X						Wagner 2007	
Computer aided quality management (CAQ)				X						Wagner 2007	
Ecology audit DIN ISO 14001				X						Wagner 2007	
EFQM model				X						Rausch 2001; Zink 2004; EFQM 2003, 2007	✓
Enterprise resource planning				X						Kappeller & Mittenhuber 2003	
Forecasting				X						Schroeder 1989	
Hoshin kanri policy deployment				X						Kaplan & Norton 2008	
House of quality				X						Pfeifer & Schmitt 2007	
IT-Infrastructure library (ITIL)				X						Macfarlane & Rudd 2001	
Kanban, just in time / sequence				X						Schmenner 1990	
Lean management				X						Kappeller & Mittenhuber 2003	
Make or buy; sourcing				X						Wagner 2007	
Materials requirement planning (MRP)				X						Schmenner 1990	
Performance management system				X						Bititci et al. 1997	
Process design				X						Thonemann 2010	
Process (business) re-engineering				X						Hammer & Champy 1995; Kappeller & Mittenhuber 2003	
Process flow analysis				X						Schroeder 1989	
Project management				X						Madauss 2000	
Quality management ISO 9000				X						Deming 1982; ISO 2000; Pfeifer & Schmitt 2007; Wagner 2007	✓
Six sigma				X						Toepfer 2004; Morgenstern 2005	✓
Statistical process control				X						Pfeifer & Schmitt 2007	
Supplier relationship management				X						Kappeller & Mittenhuber 2003	
Supply chain management				X						Schoensleben & Alard 2003; Wildemann 2006	✓
Total productive maintenance				X						Pfeifer & Schmitt 2007	
TQM				X						Zink 2004, 2006; Kamiske 2006	✓

Table 2.2: Selection of management tools

Source: Developed by researcher

Management tool	Mainly used in								Reverences	Selected	
	Strat. analy.	Strat. prem.	Strat. form.	Strategies in functional areas							Strat. exec., control.
				Oper.	HR	Mktg.	R & D	Finan.			
Assessment centre					X					Kappeller & Mittenhuber 2003	
Change management					X					Dalziel & Schoonover 1988; Kotter 2007	✓
Coaching					X					Eaton & Johnson 2001	
Continuous improvement programme					X					Imai 1992; Pfeifer & Schmitt 2007	✓
Diversity management					X					Kappeller & Mittenhuber 2003	
Motivation models					X					Wagner 2007	
Outplacement					X					Kappeller & Mittenhuber 2003	
Personnel marketing					X					Kappeller & Mittenhuber 2003	
Skill management					X					Faix et al. 1991; Wagner 2007	✓
Target agreement					X					Kappeller & Mittenhuber 2003; Wagner 2007	
ABC analysis						X				Wagner 2007	
Customer relationship management (CRM)						X				Merz 1999; Rapp 2000	
E-Commerce						X				Merz 1999	
Key account management						X				Sidow 1997	✓
Market research						X				Kotler 1988; Michaeli 2006	
Market segment./different./position.						X				Kotler 1988; Porter 1991; Trout & Rivkin 1996; Pearce & Robinso 2005	✓
Marketing mix (Kotler, 4 Ps)						X				Kotler 1988	✓
PIMS						X				Kotler 1988	
Viral marketing						X				Kappeller & Mittenhuber 2003	
Cause and effect analysis							X			Wagner 2007	
Creativity tools e.g. Delphi							X			Wagner 2007	
Failure mode and effect analysis (FMEA)							X			Pfeifer & Schmitt 2007	
Failure tree analysis							X			Wagner 2007	
Innovation management							X			Hauschildt 1993; Bierfelder 1997; Schumpeter 2003; Wagner 2007	✓
Kano model							X			Pfeifer & Schmitt 2007	
Knowledge management							X			Nonaka & Takeuchi 1995; Probst et al. 2006; BMWT 2007	✓
Quality function deployment							X			Pfeifer & Schmitt 2007	
Quality gates							X			Pfeifer & Schmitt 2007	
Target costing							X			Toepfer 2004	
Value analysis							X			Pfeifer & Schmitt 2007	
Activity based costing								X		Kappeller & Mittenhuber 2003	
Business intelligence								X		Michaeli 2006	
Liquidity planning								X		Wagner 2007	
Overhead value analysis								X		Horváth 1990	✓
Zero base budgeting								X		Pyhrr 1973; Horváth 1990	✓
Activity database									X	Pfeffer & Sutton 1999; Norburn 2002; Blunck & Sieber 2005; Kaplan & Norton 2006	✓
Audit									X	Pfeifer & Schmitt 2007	
Balanced scorecards									X	Kaplan & Norton 1996, 1996a; Davig et al. 2004	✓
Business governance									X	Wagner 2007	
Early warning system									X	Ansoff 1975; Coenenberg & Baum 1987; Keitsch 2000	✓
Risk management system									X	Kendall 1998; Keitsch 2000	✓

Table 2.3: Selection of management tools (continued)

Source: Developed by researcher

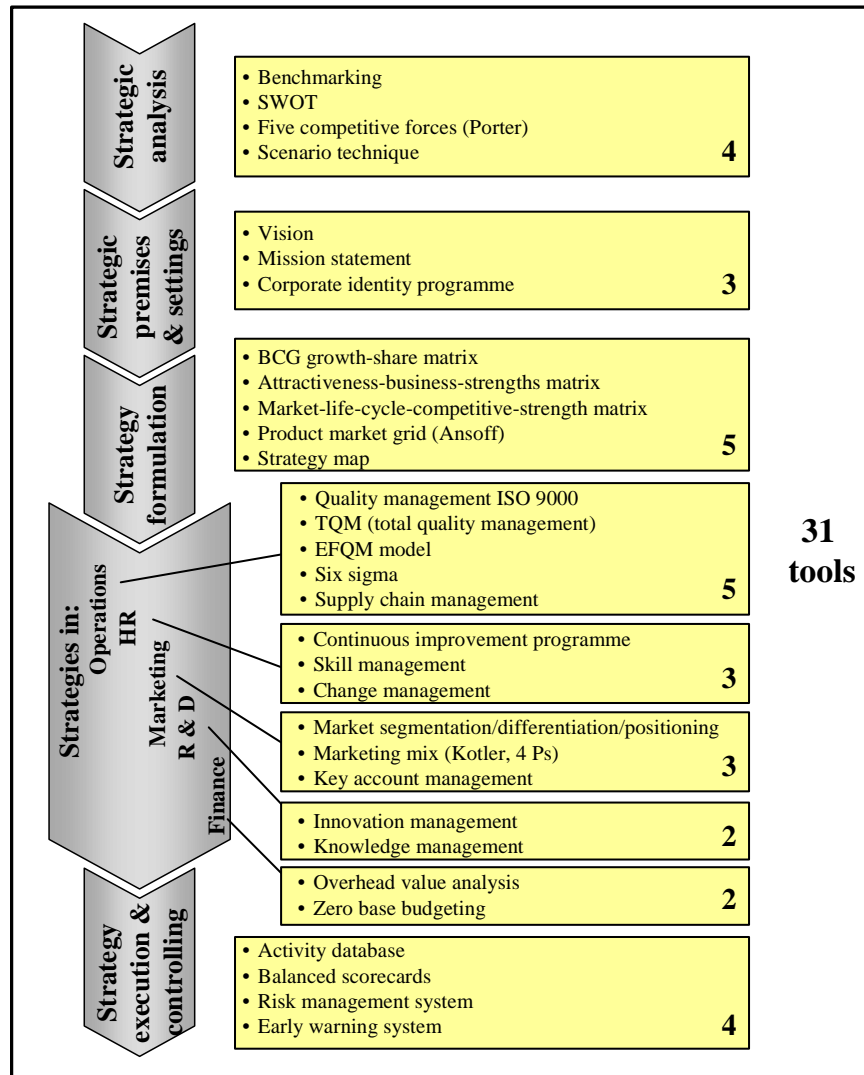


Figure 2.12: Management tools in the phases of strategic management

Source: Developed by researcher

In the following, the final selection of 31 management tools is introduced. For their strategic relevance and use in the phases of strategic management they are, in the following, called strategic management tools.

2.7.1 Benchmarking

Benchmarking is used to analyse and compare an organisation and its processes and products with those of certain competitors or with branch averages (Michaeli, 2006). Mertins et al. (1995) define five phases of benchmarking: setting objectives, internal analysis, selection (company, parameters) and comparison, definition of measures, realisation of measures.

2.7.2 SWOT analysis

The purpose of the SWOT analysis (strengths, weaknesses, opportunities, threats) is to assess a company's strategic situation via comprehensive analysis of the internal resources and the external environment (Pearce & Robinson, 2005). The strengths, weaknesses,

opportunities and threats determined can be depicted in a diagram (Pearce & Robinson, 2005) or in a table (Wagner, 2007). With the SWOT table (Table 2.1) a kind of “fever curve” for the company and a major competitor can be depicted. Opportunities exist for criteria for which the company is better than the major competitor and threats for which the company is worse.

Criterion	Weaknesses				Stregths		
	-3	-2	-1	0	1	2	3
Strategic area							
Strategic planning process							
Definition of objectives							
Corporate identity and image							
Operations							
Quality costs							
Delivery times							
Machinery and equipment							
HR							
HR planning							
HR development							
Motivation status							
Marketing							
Product portfolio							
Key-account management							
e-Commerce							
Research and development							
Number of patents							
Project management							
Time to market							
Finance							
Equity ratio							
Costs structure							
Liquidity							
Controlling							
Key figure system							
Management information system							
Early warning system							
Count own company (+)	2	5	4	3	4	2	1
Score own company (+)	-6	-10	-4	0	4	4	3
Rating own company (+)	-9						
Count major competitor (*)	0	3	5	8	5	0	0
Rating major competitor (*)	0	-6	-5	0	5	0	0
Score major competitor (*)	-6						

Table 2.1: SWOT table (example)

Source: Wagner (2007)

2.7.3 Five competitive forces (Porter)

Porter’s five competitive forces, a tool for analysing and determining the own position in the market (Porter, 1979, 1991), were already briefly introduced in section 2.2.4.2 and Figure 2.6. Competitors rival with one another in the markets for customers. The market situation determines the degree of rivalry. Low market entry barriers may threat the company. Innovative leaps may result in new products, making previous products obsolete. The market conditions determine the bargaining power of suppliers and buyer.

2.7.4 Scenario technique

For a planning period of one year, predictions and assumption can be derived or extrapolated from existing figures and statistics with a relatively high level of confidence (Wagner, 2007). For long term planning of five to ten years, however, extrapolation is not feasible anymore. The scenario funnel Figure 2.13 visualises this dilemma. With the aid of scenario technique, future potentials, visions, opportunities, threats or trends can be recognised or developed (Gausemeier et al., 1996). Scenarios can be prepared in five phases: (1) preparation and determination of the scope of the scenario, (2) analysis and determination of key parameters, (3) prognoses for different key parameters and documentation in a matrix, (4) development and description of scenarios with assessment of the probability of occurrence, (5) transfer of scenarios to strategic planning (Gausemeier et al., 1996).

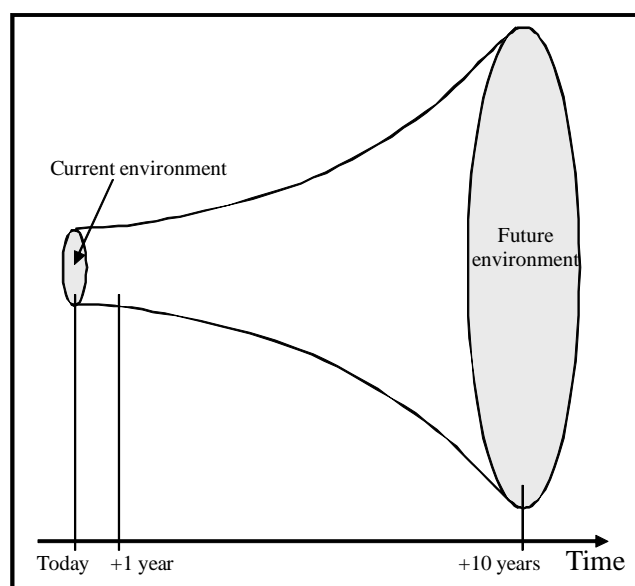


Figure 2.13: Scenario funnel

Source: Gausemeier et al. (1996)

2.7.5 Vision

A company, its leaders and employees need an overall, long-term objective, a vision that is encouraging and motivating (Wagner, 2007). The vision “*presents the firm’s strategic intent that focuses the energies and resources of the company on achieving a desirable future*” (Pearce & Robinson, 2005, p. 37). A vision can be a statement in a short sentence or documented within a graphic.

2.7.6 Mission statement

The mission statement offers an answer to the question “*what business are we in?*” (Pearce & Robinson, 2005, p. 37) and also provides information about the scope of the company, its markets, products and services (Wagner, 2007). In practice vision and mission statement are often combined in one statement (Pearce & Robinson, 2005).

2.7.7 Corporate identity programme

Within the corporate identity programme the desired appearance of the company is determined and described (Wagner, 2007). Bamberger & Wrona (2004) define three areas of corporate identity:

1. Corporate design; visual appearance, logo, design handbook
2. Corporate behaviour; style towards stakeholders, values
3. Corporate communication; types and frequency of regular meetings, committees

2.7.8 BCG growth-share matrix

The growth-share matrix (Figure 2.14), developed by the Boston Consulting Group, is used to analyse and develop portfolio strategies for businesses, profit centres, product lines and products (Hax & Majluf, 1983). A “problem child or question mark” product in the early stage of its life cycle has a high growth rate and potential, but has not yet the expected profitability. A “star” business is in a fast growing market and holds a high market share, but it takes effort to keep it there. A “cash cow” product line is in its maturity stage of the life cycle, does not need much reinvestment but generates a high gross profit. A “dog” product is in the stage of decline in a shrinking market with extensive competition and low profit margins (Pearce & Robinson, 2005).

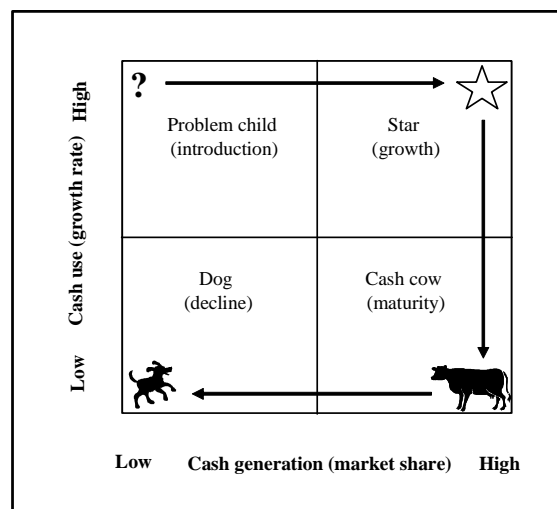


Figure 2.14: BCG growth-share matrix

Source: Hax & Majluf (1983), modified by the researcher

2.7.9 Industry attractiveness-business-strengths matrix

The industry-attractiveness-business-strength matrix, also called 9-field-matrix (Figure 2.15), was developed by McKinsey. In comparison with the BCG growth-share matrix, this strategic management tool uses several factors to assess the industry attractiveness (e.g. number of competitors, market growth) and business strength (e.g. cost position, skill

level) (Pearce & Robinson, 2005). With the aid of the industry attractiveness-business-strength matrix portfolio strategies for businesses, profit centres and product lines can be derived (Hax & Majluf, 1983a).

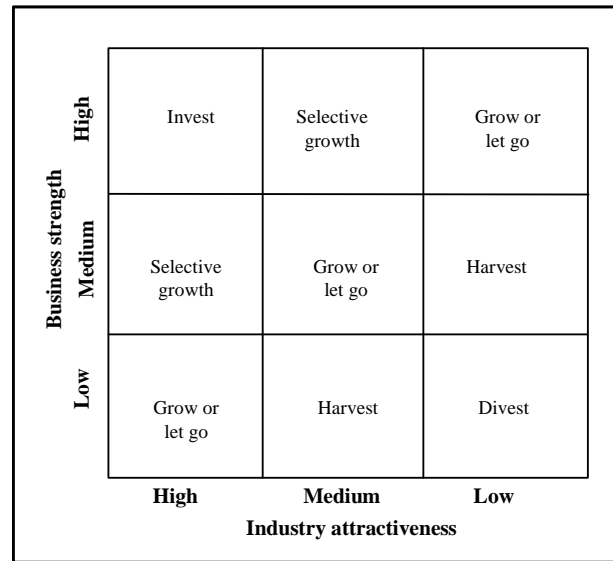


Figure 2.15: McKinsey industry attractiveness-business-strength matrix

Source: Hax & Majluf (1983a)

2.7.10 Market life-cycle-competitive-strength matrix

Another portfolio approach for the development of strategies for businesses, profit centres, product lines and products is the market life-cycle-competitive-strength matrix depicted in Figure 2.16 (Pearce & Robinson, 2005). This tool uses multiple factors for the assessment of the business strength and the stage of the market life cycle.

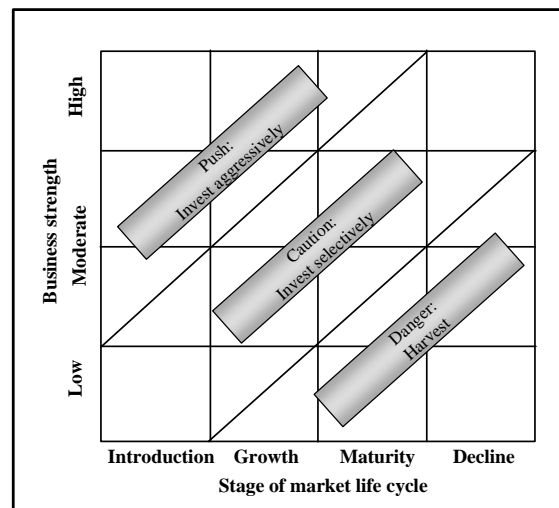


Figure 2.16: Market life-cycle-competitive-strength matrix

Source: Pearce & Robinson (2005)

2.7.11 Product market grid

With the aid of Ansoff's product market grid (Figure 2.17) strategies can be derived for products and product lines (Ansoff, 1965). A market penetration strategy can be selected

for an existing product portfolio in current markets to increase the market share. New products can be developed for current markets or new markets can be entered with the current product lines. With a diversification strategy, a new market can be entered with newly developed products.

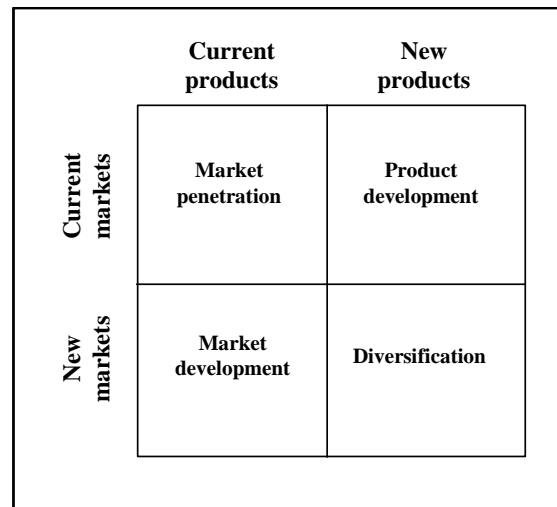


Figure 2.17: Product market grid

Source: Ansoff (1965)

2.7.12 Strategy map

By adding the dimension of strategic elements to the four perspectives of the balanced scorecard, Kaplan & Norton (2004) developed the strategy map (Figure 2.18). This strategy map is used to define, document and visualise a company's strategic direction and individual strategies.

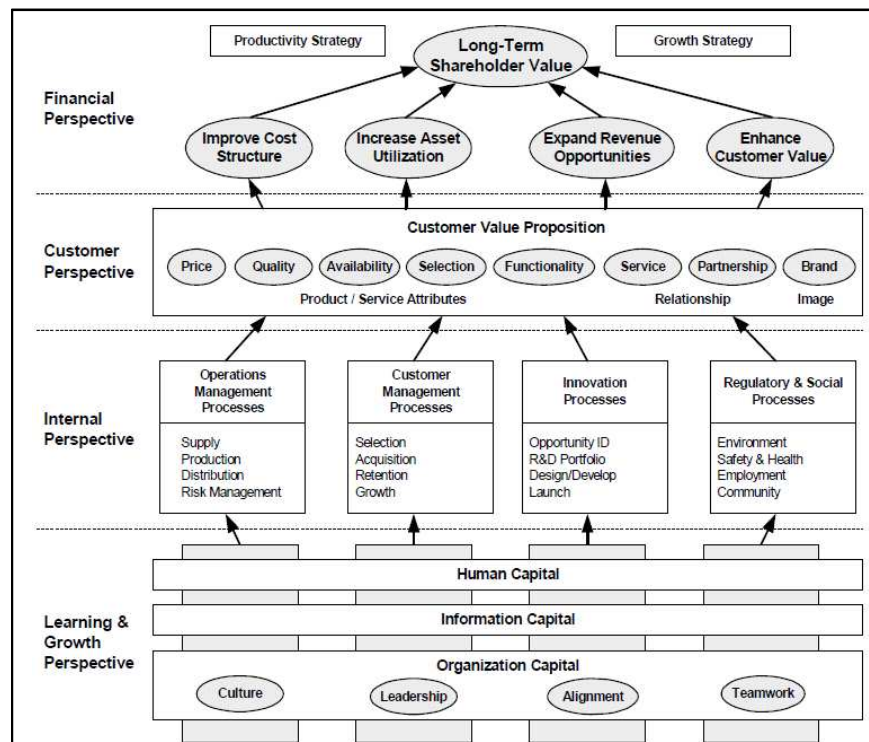


Figure 2.18: Strategy map

Source: Kaplan & Norton (2004)

2.7.13 Quality management ISO 9000

The quality management according to ISO 9000 was derived from the specification MIL-Q-9858 “quality program requirements” issued by the US Department of Defence. The ISO 9000 specifications were introduced in the late 1970s and they define and specify how a quality management system should be implemented, documented and applied (Deming, 1982; International Standards Organization, 2000; Pfeifer & Schmitt, 2007). The quality management system is documented in the quality management handbook and complemented by process instructions, organisational guidelines, etc. (Wagner, 2007).

2.7.14 TQM (total quality management)

TQM is considered as a company-wide, long-term and enduring task with strategic relevance. Quality is a strategic objective with multi-dimension: quality of products, services, processes, qualification of personnel, customer satisfaction, etc. (Zink, 2004, 2006). Kamiske (2006) describes TQM with the pyramid model (Figure 2.19) and lists numerous tools as part of TQM.



Figure 2.19: TQM pyramid model

Source: Kamiske (2006)

2.7.15 EFQM model

The EFQM model, also called TQM / EFQM model, was introduced in the mid 1980s (see Figure 2.8 in section 2.6.1). As TQM, it defines quality as a strategic objective with multi-dimension (Zink, 2004); however, the EFQM measures the degree of achievement. It considers so called enablers and results. Enablers are leadership, people, policy and strategy, partnerships and resources, as well as processes. Results are measured in the areas of people (e.g. employee satisfaction), customers (e.g. customer satisfaction), society (e.g. corporate citizenship), as well as key performance indicators (Rausch, 2001; EFQM, 2003, 2007).

2.7.16 Six sigma

Six sigma is a strategic management tool for the rapid improvement of products, services and processes. This tool includes a system to measure the efficiency and effectiveness of the improvement process (Morgenstern, 2005). The strategic objective is zero defect quality. In statistical methodology the Greek letter sigma (σ) stands for standard deviation. Six times σ , six sigma, means that in a given population of one million only 3.4 defects are acceptable. With other words, any population shall be 99.99966% free of defects (Toepfer, 2004). Six sigma employs sub-tools such as project management, Ishikawa diagram, computer aided quality systems, failure mode and effect analysis, statistical methodology (Toepfer, 2004).

2.7.17 Supply chain management

The aim of supply chain management is to optimise the value chain and flow of materials and products from the supplier to the customer. Supply chain management improves the efficiency and effectiveness of the logistics chain in a holistic approach (Schoensleben & Alard, 2003). Wildemann (2006) describes guidelines characterising supply chain management:

- Key competences regarding management of networks with changing partners
- Cooperation with the networks
- Reduction of process times, cycle times and lead times
- Coordinated transmission of information for planning, controlling to and between value chain partners
- Control and management of complexity; e.g. number of suppliers, products, customers
- Quality management

2.7.18 Continuous improvement programme

Whereas six sigma seeks rapid and quantum leap advancements of some special selected cases promoted by teams, a continuous improvement programme aims for constant numerous improvements of products, services and processes involving all employees of a company (Pfeifer & Schmitt, 2007). The idea of constant improvements in quality was introduced in the late 1950s by Deming and Juran. Often, constant improvement programmes are called Kaizen (改善), the Japanese term for improvement (Imai, 1992). Continuous improvement programmes employ sub-tools such as Kanban, quality circles, HR development (Imai, 1992).

2.7.19 Skill management

Skill management is a strategic management tool in the context of personnel planning and personnel development. The aim is to have the personnel with the required qualification at the right time in the right place. Skill management uses sub-tools such as personnel assessment, training, career planning, recruitment (Faix et al., 1991). Figure 2.20 depicts the process of skill management (Wagner, 2007).

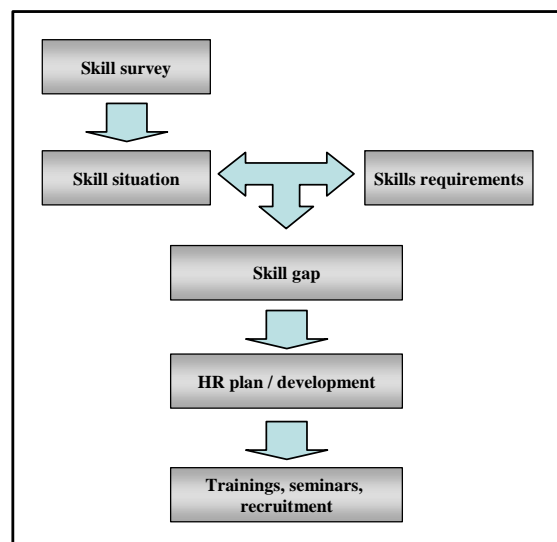


Figure 2.20: Skill management

Source: Wagner (2007)

2.7.20 Change management

Dalziel & Schoonover (1988, pp. 3, 10) define change “as a planned or unplanned response of an organisation to pressures” and state that “it is a necessity for economic survival”. Necessity for change can stem from internal or external sources. A systematic change management helps to prepare the organisation and employees for change, mitigate resistance to change and allows successful realisation (Dalziel & Schoonover, 1988). Kotter (2007, p. 99) recommends eight steps for transforming change to organisations:

1. “Establishing a sense of urgency

2. *Forming a powerful guiding coalition*
3. *Creating a vision*
4. *Communicating the vision*
5. *Empowering others to act on the vision*
6. *Planning for and creating short-term wins*
7. *Consolidating improvements and producing still more change*
8. *Institutionalising new approaches”*

2.7.21 Market segmentation, differentiation, positioning

Markets and customers differ in buying practices and demands. Market segmentation considers this by building customer or market segments. These segments can be defined by wants and need, geographical aspects, attitudes, behaviour, etc. The aim of market segmentation is to serve the individual segments or customer groups better by customising the marketing mix for them (Kotler, 1988).

A competitive advantage can be accomplished by differentiating products, services and processes from the competition (Porter, 1991; Pearce & Robinson, 2005).

Trout & Rivkin (1996) state: “*Marketing battles take place in the customers mind*”. A positioning strategy considers this by communicating and designing the company’s or product’s image in the customer’s mind (Kotler, 1988). This can be accomplished by selecting specific competitive advantages of the company or products and effectively communicating this in a positioning strategy (Kotler, 1988).

2.7.22 Marketing mix

Figure 2.21 depicts Kotler’s, 4 Ps of the marketing mix: product, price, promotion, place. The marketing mix is designed to satisfy the wants and need of the customers in a certain target market segment (Kotler, 1988).

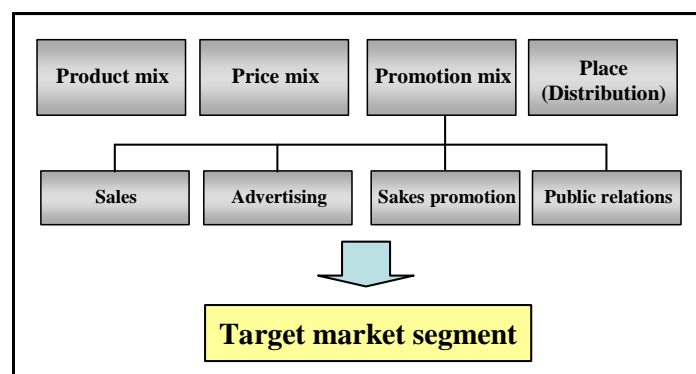


Figure 2.21: Marketing mix

Source: Kotler (1988) modified by researcher

2.7.23 Key account management

With key account management, special strategies, organisation and marketing mix elements are defined to serve “the most important customers”. The purpose is to build up and maintain a long-lasting relationship with customers vital to the company. Key customers can be defined via ABC analysis of the actual turnover per customer or by the assessment of the future sales potential (Sidow, 1997).

2.7.24 Innovation management

Schumpeter (2003, p. 132) states: “*The function of entrepreneurs is to reform or revolutionize the pattern of production by exploiting an invention or, more generally, an untried technological possibility*” and sets the foundation of innovation management. Hauschildt (1993) classifies innovation in product innovations and process innovations. The latter can be technological or administrative. He defines innovation management as “*a dispositive organisation of individual innovation processes and innovation institutions*” (Hauschildt, 1993, p. 23). Bierfelder (1997, p. 180) considers innovation management as “*efficient organisation of development, adoption and distribution of innovations*”. Figure 2.22 provides a pragmatic approach to managing the innovation process (Wagner, 2007).

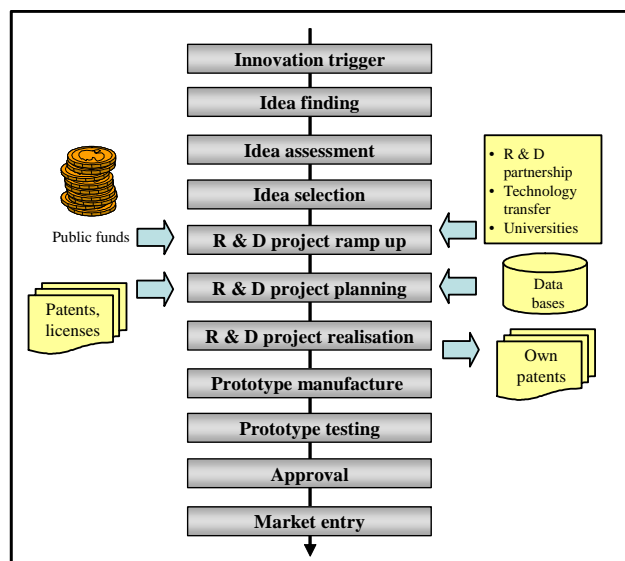


Figure 2.22: Innovation process

Source: Wagner (2007)

2.7.25 Knowledge management

Nonaka & Takeuchi (1995) stress the importance of tacit and explicit knowledge. The latter is the formal “codified” knowledge, what is known formally and what can be transmitted. Tacit knowledge is what is known implicitly, internally, context-specific and therefore hard to formalise and communicate. Knowledge management can be defined as a

system for gathering, collecting, storage, supply, allocation and protection of expert know how (BMWT, 2007). Probst et al. (2006) describe the elements of knowledge management in a knowledge management circle (Figure 2.23).

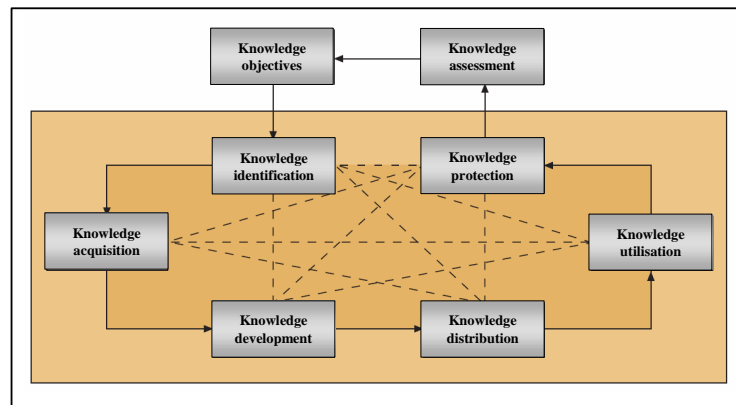


Figure 2.23: Knowledge management circle

Source: Probst (2006)

2.7.26 Overhead value analysis

Operational areas not directly involved in production, so called overhead functions, are also subject to productivity improvements. One approach to gain productivity improvements and thus reducing overhead costs is the overhead value analysis. Horváth (1990) suggests the overhead value analysis in three phases. The preparation phase sets the organisational prerequisites and guidelines. In the analysis phase, tasks and costs are structured and evaluated, ideas are created and assessed and an action plan is defined. In the realisation phase, the action plan is approved and realised step by step. One may suggest adding a controlling phase in which the success of the overhead value analysis is measured and communicated to the organisation.

2.7.27 Zero base budgeting

Extrapolation of budget figures from one period to the other may result in an unrealistic dimensioning of resources and thus in avoidable costs. The aim of the zero base budgeting is to avoid this situation. The zero base approach requires that the budget figures are analysed, planned in detail and justified. The latter includes the question whether a certain planning element is necessary at all (Pyhrr, 1973; Horváth, 1990).

2.7.28 Activity database

Pfeffer & Sutton (1999) describe the dilemma of the knowing doing-gap. Norburn (2002), as well as Kaplan & Norton (2006), point out the importance to link strategic planning with implementation. The link can be made with a consequent recording, follow up and follow through on all tasks or activities defined and agree upon. This can be supported by an activity database with the aid of e.g. Microsoft Excell or Access. Another option are file share databases such as the Lotus Notes work.box (Blunck & Sieber, 2005).

2.7.29 Balanced scorecard

The balanced scorecard is used as a strategic management tool. Unlike traditional systems, the balanced scorecard provides a set of performance indicators in different areas with the aim of translating a company's strategy into reality (Kaplan & Norton, 1996, 1996a). Davig et al. (2004) point out the benefits of the balanced scorecard for SMEs. Figure 2.24 depicts an example of a balance scorecard.

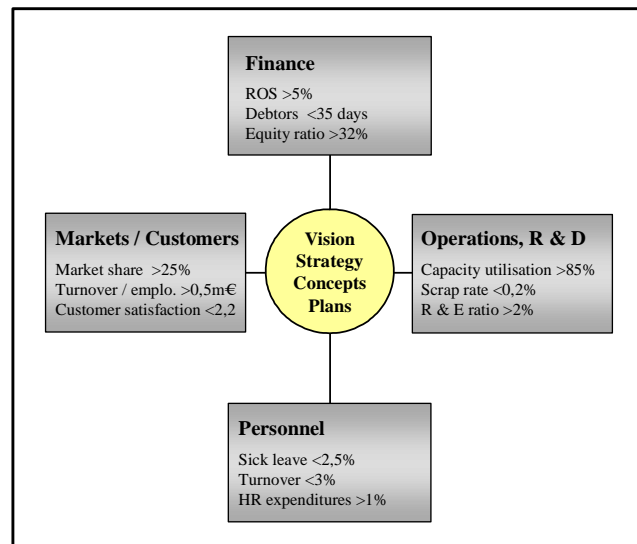


Figure 2.24: Balanced scorecard

Source: Kaplan & Norton (1996), modified by researcher

2.7.30 Risk management system

Taking advantage of opportunities and chances means taking risks, which cannot be avoided, but mitigated with the aid of a risk management system (Kendall, 1998). Kendall (1998) classifies risks in four categories: market risks, operational risks, credit risks and legal risks. Risks must be made transparent and evaluated by assessing the probability of occurrence and the risk level. Emergency plans, early warning, insurances, audits, etc. help to mitigate existing risks (Keitsch, 2000).

2.7.31 Early warning system

Every strategic plan is based upon quantitative and qualitative assumptions, premises and environmental parameters. The latter may change at any time. Ansoff (1975) argues that changes in the environment relevant to a company's strategy, strategic surprises, announce themselves via "weak signals". With continuous monitoring and a formalised early warning system, signals from the environment can be received, assessed and interpreted early enough to take appropriate measures (Coenenberg & Baum, 1987; Keitsch, 2000). Coenenberg & Baum (1987) define three phases of an early warning system:

1. Identification of signals; problem recognition

2. Diagnosis; search for reasons and interdependences

3. Evaluation; prognosis of relevance, magnitude and urgency

Keitsch (2000) recommends an early warning system with external (e.g. market trends) and internal parameters (e.g. liquidity).

The 31 strategic management tools selected, introduced and described above will be used for measuring the management knowledge in the research sector. They were selected with the aim to reflect all phases of strategic management (McCarthy et al., 1975; Welge & Al-Laham, 2003; Wagner 2001) and clustered in nine areas (Figure 2.12). This allows an assessment of management knowledge in specific phases of strategic management.

2.8 Summary

This chapter has described the history and state of management and strategic management. Strategies and strategic management have its origin in the military area and were introduced to the business economics by management scientists in the 1950s (Cyril & Magee, 1953; Shubik, 1955; Payne, 1957; Ansoff, 1957). Today a wide variety of generic strategies, strategic management models and tools are available to executives and strategic management is regarded as an important instrument for managing an enterprise.

Strategic planning is controversially discussed (Mintzberg, 1994a; Vasconcellos e Sá, 1989), but if executives consider the elements of strategic planning (O'Regan & Ghobadian, 2007) and take action from it (Mankins & Steele, 2006), it is a valuable tool.

The chapter continues with the introduction and brief description of a selection of strategic management models that are the basis for the set of strategic management tools. These tools reflect the phases of strategic management and they will be used in the field research to measure and quantify the penetration of strategic management in the research sector.

In the course of this chapter the researcher defined key terms in the context of strategic management (Table 2.4).

Term	Researcher's definitions
Management	An institution, process and method to direct the business resources
Strategy	A strategy is a consistent plan of action directed to the vision and objectives
Strategic direction	A paramount strategy selected for a company, directed to the vision and objectives
Strategic	The attribute of a plan, way of thinking, or behaviour that meets the characteristics of a strategy
Strategic thinking	A mindset / mentality towards applying strategies
Strategic behaviour	Acting towards applying strategies
Stratagem	A concealed action to reach a certain objective
Tactic	An action to support the strategy
Operations management	Management of the processes related to the manufacture and supply of goods and services along the entire supply chain
Strategic management	Strategic management is a combination of strategic thinking (mind set) and strategic behaviour (process). The latter consist of strategic planning, strategy execution and controlling
Strategic planning	Strategic planning is the core element of strategic management. It is an iterative ongoing process, consisting of strategic analysis, strategic premises and settings and strategy formulation
Management tool	An instrument, procedure or method to support the management praxis
Strategic management tool	A management tool with strategic relevance, used to support the phases of strategic management

Table 2.4: Researcher's definitions of key terms in strategic management

Source: Developed by researcher

Figure 2.25 summarises the issues and conclusions drawn, the contribution to the research project made with this chapter and research questions arising.

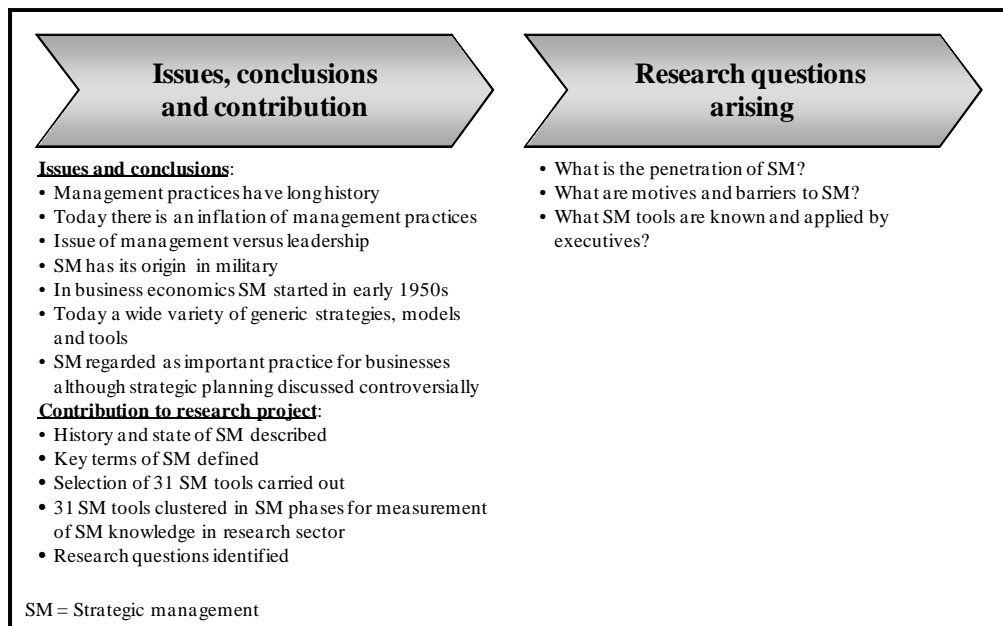


Figure 2.25: Chapter contribution and summary

Source: Developed by researcher

The following chapter describes the SME community in Europe and Germany, the peculiarities of the German “Mittelstand” and the research sector machinery and equipment.

3 The SME community and research sector; status and challenges

“The world we have made as a result of the level of thinking we have done thus far creates problems that we cannot solve at the level as they were created.”

Albert Einstein (Quoted in Handelsblatt, 2005, p. 68)

3.1 Introduction

Chapter 2 discussed the history and state of strategic management and introduced a set of strategic management tool to be uses in the field research.

Figure 3.0 list the objectives for this chapter.

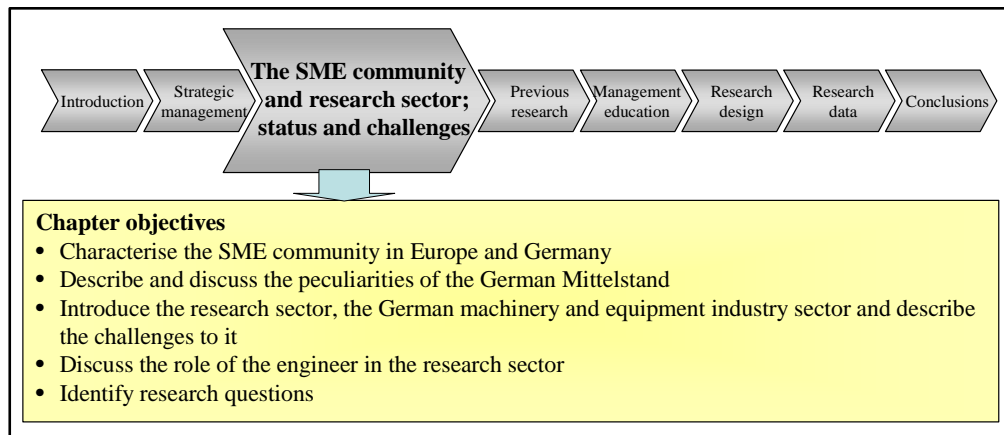


Figure 3.0: Objectives chapter 3

Source: Developed by researcher

This chapter provides facts and figures on the SME community in Europe and Germany and describes the peculiarities of Germany’s “Mittelstand”. With regard to German industry, the data and facts for its manufacturing section and its machinery and equipment sub-sector are indicated and its history, importance and challenges, in the context of national and global environment, are described. The chapter concludes with the discussion of the role of the engineer in the machinery and equipment sector (Figure 3.0).

3.2 The SME community in Europe

Micro, small and medium-sized enterprises (SMEs) play an important role in Europe’s society and economy. They make up a large part of the economy and employ the vast majority of the working population (European Commission, 2005). In 2003, the total number of SME enterprises within the European Economic Area (EEA, EU-19) has been counted as 19.3 million (99% of the total). They employ around 97.4 million people which are about 70% of the total (European Commission, 2004). Thus, promoting SMEs entrepreneurship, investments and growth as well as improving business environment and competitiveness is one of the European Union’s chief tasks.

In the European Council Summit in Lisbon, March 23 - 24, 2000, strategic objectives were defined for the next decade. One important objective was that the European Union would become “*the most competitive and dynamic knowledge-based economy in the world, capable of sustainable economic growth with more and better jobs and greater social cohesion*” (Lisbon Council, 2000, p. 1). Subsequently, the Heads of State or Government endorsed the European Charter for Small Enterprises in order to support their important role for the European economy. The Charter requests the European Commission and the Member States to take measures to support SMEs and their business environment. In the meantime, this charter was expanded geographically and endorsed by the new members of the European Union: Cyprus, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovakia and Slovenia. Including EFTA Member States and EU Applicants, currently 35 countries participate in the charter process. The charter has enforced the SMEs role in the European Community and numerous activities and initiatives were started to benefit the SMEs (European Commission, 2005b).

The European Commission and the Member States to support SMEs have, so far, initiated the following major activities (European Commission, 2005c):

- Education for entrepreneurship; initiatives to foster entrepreneurial mindset through school education (which the researcher appreciates)
- Availability of skills; promotion of educational training and improvement of skills
- Better legislation and regulation; improvement of the business environment by e.g. simplifying existing community legislation and fewer and less burdensome regulations
- Cheaper and faster start-up; initiative to reduce costs of start-ups and burdensome or time consuming procedures
- Improving on-line access; programme to improve EU's and Member States on-line portal for electronic communication and information
- More out of single market; realisation of reforms to promote the EU-internal market e.g. by improved procedures for public procurement and cross-border payment systems
- Taxation and financial matters; adaptation of tax systems to reward success and encourage start ups; promotion of the pan-European capital market; access to structural funds by the EIB (European Investment Bank)
- Strengthening the technological capacity; programme to foster research and technological development and respective cooperation
- E-business models and business support; programme to create and improve business support systems, networks, websites and services

- Improve SME representation at EU and national level; assignment of a SME Envoy as an interface to the SME community; involvement of SMEs in standardisation committees

An annual progress report regarding ongoing activities, programmes and initiatives is prepared by the SME envoy. In his 2005 report, he indicated that “*the charter process has clearly led to improved coordination between services involved in policies affecting SMEs*” (European Commission, 2005c, p. 9). The European charter for SMEs introduced by the European Commission is making good progress: the EU programmes and initiatives have become more SME-friendly and the SMEs benefit from that, but the SME envoy still sees room for improvements. For example, the complex rules regarding participation in EU programmes deters SMEs from applying for them and the handling time for application is also perceived as inadequate (European Commission, 2005c).

Enterprise category	Headcount annual work unit (AWU)	Annual turnover	Or	Annual balance sheet total
Medium-sized	< 250	<= € 50 million (in 1996 € 40 million)	Or	<= € 43 million (in 1996 € 27 million)
Small	< 50	<= € 10 million (in 1996 € 7 million)	Or	<= € 10 million (in 1996 € 5 million)
Micro	< 10	<= € 2 million (in 1996 not defined)	Or	<= € 2 million (in 1996 not defined)

Note: One person per year is one AWU; part time staff or persons not employed a full year are fraction of one unit

Table 3.1: Classification of SMEs in the EU

Source: European Commission (2005a)

The first common SME definition was established by the European Commission in 1996 (recommendation 96/280EC of 3. April 1996). This recommendation was widely used within the European Union. So that recent economic developments could be considered, the European Commission established a new recommendation regarding SME definition on May 6, 2003 (2003/361/EC of 6. May 2003). This new recommendation was the result of discussions between Commission, member states, business organisations and experts and was accepted by all EU member states. It became effective as of January 1, 2005 and will apply to all activities, programmes, initiatives and policies that the Commission assigns for SMEs (Table 3.1). Three parameters, staff headcount, annual turnover and annual balance sheet total are defined with threshold values for the SME categories. Micro enterprises will employ up to 9 persons and the annual turnover or balance sheet total will not exceed € 2 million, while small enterprises are classified as those having up to 50 employees with an annual turnover of € 10 million. The values for medium-sized companies are 250 employees and € 50 million for annual turnover or balance sheet total. Beyond these threshold values, companies are considered as large scaled enterprises (LSEs). The main objective of the new SME definition is to promote innovation and

partnership and to assure that only those enterprises that need support are targeted (European Commission, 2005a).

		SMEs	LSEs	Total
Number of enterprises	(1 000)	19 270	40	19 310
Employment	(1 000)	97 420	42 300	139 710
Occupied persons per enterprise		5	1 052	7
Turnover per enterprise	€ Million	0.9	319.0	1.6
Share of exports in turnover	%	12	23	17
Value added per occupied persons	€ 1 000	55	120	75
Share of labour costs in value added	%	56	47	52

Table 3.2: Basic facts about SMEs and LSEs in EU-19, 2003

Source: European Commission (2004)

Over 92% of the SME population are micro enterprises, employing about 56% of the SME workforce (European Commission, 2004). Mid-sized companies represent only 1% of the SME population but provide jobs for almost 19% of the SME workforce (Table 3.3). In EU plus candidate countries as of 2001 (Bulgaria, Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, Slovak Republic, Slovenia, Turkey) 5,970,000 enterprises were counted. The vast majority, 5,950,000 are SMEs. They employ two thirds of the total working population of 30,670,000.

		Micro	Small	Mid-sized	Total SME	LSE	Total
Europe-19 (2003)							
Number of enterprises	(1 000)	17 820	1 260	180	19 270	40	19 310
Occupied persons	(1 000)	55 040	24 280	18 100	97 420	42 300	139 710
Occupied persons / enterprise		3	19	98	5	1 052	7
Acceding and Candidate Countries (2001)							
Number of enterprises	(1 000)	5 670	230	50	5950	10	5 970
Occupied persons	(1 000)	10 210	4 970	5 350	20 530	10 150	30 670
Occupied persons / enterprise		2	22	107	3	919	5

Table 3.3: Roles of SMEs in EU-19 and acceding and candidate countries

Source: European Commission (2004)

A survey carried out in 2003 by the European Network for Social and Economic Research (ENSR) revealed some major constraints and challenges facing European SMEs (European Commission, 2004). One is access to skilled labour. Employees prefer LSEs as they provide, in their opinion, more opportunities, higher salaries and a better image. Another constraint is access to financial resources. Financial institutions have become more reluctant to finance SMEs: some even think of withdrawing from this sector. This situation was caused by bad debts caused by business failures as well as Basel II regulations for bank loans. SMEs are faced with increasing competition caused by imports from emerging economies or opened markets (Braun & Schaefer, 2005). This pressure is likely to increase in the future, in the context of globalisation, as economies such as China and India promote exports to the EU (Bitzer et al., 2004; Impuls, 2007; Koehler et al.,

2006; Steingart, 2006). SMEs can meet these challenges by making their enterprise more efficient, by planning for innovations and the internationalisation of their business. One efficient way to internationalise is to export wherever possible and feasible (European Commission, 2004).

Business organisations and institutions in the European Union and organisations in the home countries support SMEs in many respects. Support is provided by funding research projects, innovations or training, help for start ups and benchmarking, in addition to statistical information. One important organisation, supporting the European Commission and national governments is the ENSR: this network of member-organisations in 32 countries has specialized in applied social and economic research with a focus on SMEs. The ENSR, founded in 1990 with its original name European Network for SME Research, carries out research on business issues such as entrepreneurship, enterprise development, SME policy development, management, competence development, internationalisation, finance, labour market, energy and environment (ENSR, 2005).

SMEs receive more attention and focus in Europe. Austria's Chancellor and Chairman of the EU Council of Ministers in 2006 emphasised the importance of the European SME as the most important employer in Europe (Schuessel, 2006) and asked the EU Commission President to end the preference of LSEs for allocation of funds from the EU

The importance of the European SME community for the economy and society is recognised by the European Parliament and Commission. Numerous measures are taken to help SMEs to succeed. Improvements in legislation or regulations are made and structural support is provided. One important topic on the EU agenda is entrepreneurial education, which is of interest to this research project.

The next section characterises the specifics and importance of the German SME community.

3.3 The SME community in Germany

Based upon estimates by EIM Business & Policy Research, Netherlands and other EU sources, Germany hosted with over 3 million enterprises (3.6% of Germany's citizens) in 2003 the second largest SME community in Europe-19 (Table 3.4) (European Commission, 2004). The predominant category of micro enterprises with up to 9 employees accounts for over 2.66 million, about 88% of the total SME population. Small enterprises with up to 49 employees make up 307 thousand (10.2%) and medium-sized enterprises with up to 249 employees 44 thousand (1.5%) (European Commission, 2004).

The German member of the ENSR network, IfM (Institut fuer Mittelstandsforschung, Bonn, Institute for SME-Research) applies a different classification of SMEs for statistics and research projects. However, the EU classification of SMEs, effective as of 2005 (European Commission, 2005a), will gradually replace the traditional IfM Bonn definition.

According to the IfM classification, small enterprises have a number of employees of up to 9 and a turnover of up to € 1 million per year. Medium-sized companies employ 10 to 499 persons and have an annual turnover of € 1 million to € 50 million (Guenterberg & Kayser, 2004). LSEs are defined as enterprises beyond these threshold values.

According to the IfM Bonn in 2003 (Guenterberg & Kayser, 2004), 3.38 million SMEs (up to 499 employees) were registered in Germany. These are 99.7% of all enterprises subject, to VAT. They provided jobs for approximately 19.98 million people, which represent 70.2% of all employees in businesses and realised 41.2% of the overall turnovers. The SME community is an important factor in the German education system. It provided vocational training to 81.9% of all apprentices (1.34 million) in 2003 (Guenterberg & Kayser, 2004).

No of enterprises (1 000)	Micro	Small	Mid-sized	Total SME	LSE	Total
Austria	233	30	5	267	1	268
Belgium	408	25	4	437	1	438
Denmark	180	21	4	205	1	206
Finland	207	12	2	221	1	222
France	2 326	144	25	2 495	6	2 501
Germany	2 656	307	44	3 008	11	3 019
Greece	752	16	2	771	0	771
Ireland	83	12	2	97	0	97
Italy	4 290	177	19	4 586	3	4 489
Luxembourg	21	3	1	24	0	24
Netherlands	517	43	9	570	3	572
Portugal	648	39	6	693	1	694
Spain	2 499	156	19	2 674	3	2 677
Sweden	454	27	4	485	1	486
United Kingdom	1 996	200	31	2 226	8	2 234
EU-15	17 272	1 211	176	18 659	39	16 896
Iceland	28	1	0	29	0	29
Norway	218	17	3	238	1	238
Switzerland incl. Liechtenstein	306	32	6	343	1	344
Europe-19	17 824	1 261	185	19 270	40	19 310

Note: Classification of SMEs according to the EU definition

Table 3.4: SMEs in EU-19 by countries in 2003

Source: European Commission (2004)

In the last few years, the number of SMEs in Germany has risen. In 2003, the SME community grew by 70,800 enterprises (2.4% increase); 508,600 start-ups, 437,800 liquidations) and in 2004 by 143,800 (4.8% increase); 572,500 start-ups, 428,700 liquidations) (Kayser, 2005). The large increase of start-ups, in 2004, can be linked to the Government programmes “Ich-AG” (Me-Corporation) and “Ueberbrueckungsgeld” (bridge money). With these programmes, introduced in January 2003, unemployed people are encouraged to start up their own business: funding is provided and training and seminars are offered to unemployed women and men who are determined to take the step into self-employment.

Between January 2003 and May 2004, about 155,600 micro businesses (1.9% of Germany's citizens) were started under both Government programmes. Since the Government neither requires definite knowledge and skills nor specific training for starting up an "Ich-AG", the success of these programmes is questioned by opposition leaders and associations. (Kleinen et al., 2004).

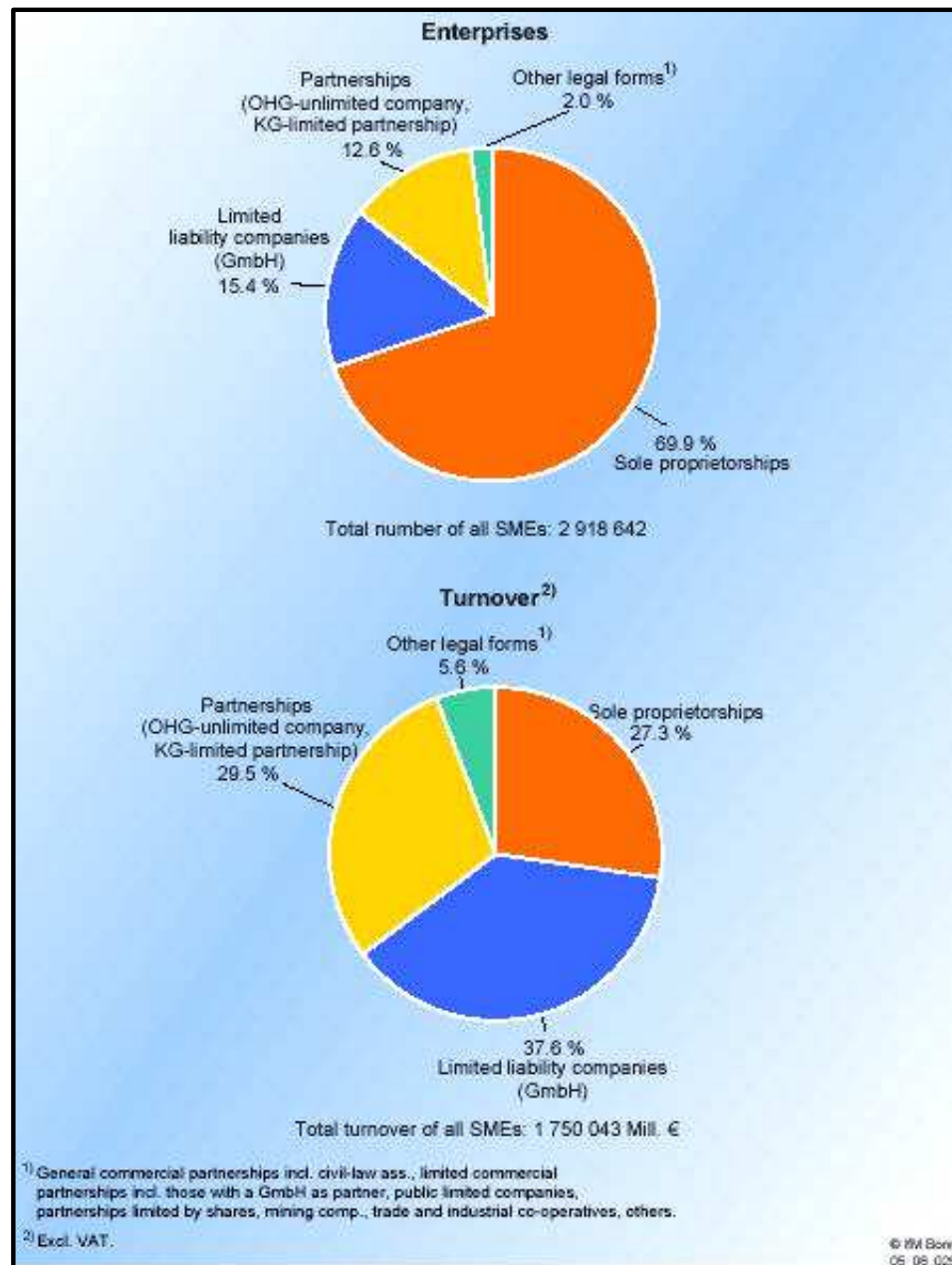


Figure 3.1: German SMEs by legal forms, 2002

Source: Guenterberg & Kayser (2004)

Around 69.9% of all German SMEs are sole proprietorships, 15.4% limited liability companies (GmbH) and 12.6% partnerships (OHG, KG). Other legal forms such as AG (stock corporation) represent approximately 2% of the German SME population (Figure 3.1) (Guenterberg & Kayser, 2004).

In 2003, a total number of 39,320 enterprises in Germany became insolvent. Based upon the EU-statistics of enterprises, this represents approximately 1.30% of all German

companies. In 2004 the number of insolvencies fell slightly to 39,213 (1.24%) (Kubista, 2005). The number of insolvencies rose continuously from 8,730 in the year 1990 (0.26%) to its current level (Guenterberg & Wolter, 2002). Lack of demand caused by low economic growth, or stagnation, deteriorating payment behaviour and lack of equity capital are major reasons for the increase of the insolvency rate by 400% within 15 years (Guenterberg & Wolter, 2002). The art of management, which is part of the forthcoming research, may also be an important factor in that trend. In comparison, the number of insolvencies in the UK in 2003 was 14,500, approximately 0.65% of all companies registered (Anon, 2005).

The next section describes the characteristics of the German Mittelstand, which is unique in the European SME community.

3.4 The German Mittelstand

Ludwig Erhard, former German Minister of Economic Affairs and Federal Chancellor assessed the Mittelstand in a speech as follows (translation) *“If we understand Mittelstand from the perspective of material aspects, if Mittelstand, so to speak, is read from the tax tables, then the term Mittelstand, in my opinion, will be given a dangerous turn. The Mittelstand can in its importance, be not fully weighed by material aspects, but it is ... more strongly pronounced by an ethos and attitude in the socio-economic and political process”* (Erhard, 1955, pp. 5-6).

The term Mittelstand and its history are described in section 1.3.2.

3.4.1 Quantitative aspects of the German Mittelstand

The economic Mittelstand is the total amount of companies up to a “certain size”, small businesses and self-employed. However, there is no clear definition and no accurate size indicators, such as number of employees, turnover or balance sheet total are defined. In addition, there are also size classifications by economic sectors in use, e.g. companies in the building and construction sector are considered as SME if the total annual turnover does not exceed € 50 million. On the other hand, retailers with a turnover of more than € 12.5 million are considered as LSE (Jordan, 2001).

The KfW Bank Group defines a target group of SMEs with an annual turnover up to € 500 million for ratings in Germany (Taistra, 2004). Founded in 1948, the KfW Bank is owned by the Federal Government of Germany with an 80% share and the Federal States own 20%. It played a key role in financing and promoting the recovery of the Mittelstand after World War II: one of its branches the KfW Mittelstandsbank.

The German Commercial Code § 267 (HGB, 2005) classifies small and medium-sized capital companies such as GmbH and AG as follows:

1. Small capital company (at least two of the following three parameters shall not be exceeded):
 - a. € 4,015,000 balance sheet total (excluding deficit stated on the asset side of the balance sheet (§ 268, 3))
 - b. € 8,030,000 total turnover within 12 months prior to closing date
 - c. 50 employees yearly average
2. Medium-sized capital company (companies exceeded at least two of the three parameters in section 1. or companies where at least two of the following three parameters are not exceeded)
 - d. € 16,060,000 balance sheet total (excluding deficit stated on the asset side of the balance sheet (§ 268, 3))
 - e. € 32,120,000 total turnover within 12 months prior to closing date
 - f. 250 employees yearly average

The threshold values a and b listed above are adjusted from time to time.

For statistical purposes, the German Mittelstand is classified by the IFM Bonn (small up to 9 employees and turnover up to € 1 million; medium-sized 10 to 499 employees and turnover € 1 to € 50 million). This is currently the mostly used and cited classification for statistical purposes.

The German Government uses different quantitative classifications for the Mittelstand. In answer to a parliamentary question regarding the state and perspectives of the German Mittelstand, it was stated that SMEs are classified as having less than 500 employees and a turnover of DM 100 million (around € 51 million) (Bundestag, 1986). The KfW Mittelstand programme of the Federal Ministry of Economics, regarding loans with reduced interest rates funds, "Mittelstand enterprises" with the majority in private ownership with a turnover of up to DM 1 billion (around € 511 million) (Bundesministerium, 1996).

The EU definition of SMEs, effective as of January 2005, (Table 3.1) has assumed more importance in classifying Mittelstand / KMU / SME companies in order to make the statistics comparable within the EU as well as for funding and research programmes.

3.4.2 Qualitative aspects of the German Mittelstand

In academic discussions, socio-economic research and socio-political considerations, the qualitative aspects of the German Mittelstand are of central importance. The following qualitative attributes are considered (Guentenberg & Wolter, 2002a):

- Unity of enterprise ownership (coherence) and management, liability, risk
- Entire or, at least, major independence from a corporate group; according to IfM surveys 94.8% of all German SMEs are fully independent and in no way linked with other enterprises
- Responsible, accountable participation in making all relevant decisions regarding company policy and strategies
- Direct influence on all important strategic and operational decisions having consequences on:
 - Relationship between owner and employees
 - Leadership style
 - Type of organisation and legal form
 - Way of decision making
 - Financial issues
 - Behaviour in the market
 - Relationship with the company environment and stakeholders

Rauen (2002, p. 4) differentiates between “*old Mittelstand*” and “*new Mittelstand*”. The “old” Mittelstand is characterised by entrepreneurs owning and managing the enterprise. They are completely engaged in the business, carry all risks and are fully liable even with their private assets, whereas the “new” Mittelstand consists of companies managed by employed executives, acting independently and carrying responsibility for the business.

The German Government does not see the necessity for a precise definition of Mittelstand or the Mittelstand economy, since the enterprises considered under the term Mittelstand are not homogenous (Bundestag, 1986).

Approximately 95% of all companies in Germany are owner or family run enterprises. In the industrial sector, this share is at around 84%. Even 30% of all German public limited companies (Aktiengesellschaften) are managed by families (Roehl, 2005).

The next section describes the importance of the German Mittelstand.

3.5 The importance of the SMEs and Mittelstand to German economy and society

Between 1987 and 1996, SMEs in Germany created around 2 million (c. 5% increase) new jobs. In the same period LSEs reduced employment by approximately 500,000 (c. 1% decrease) jobs (Hinsken, 1998). The Mittelstand is Germany’s most important employer,

providing employment to around 70% of the total workforce. Today, the German Mittelstand represents 99.7% of all German companies and Germany's economic future is highly dependent upon the community of small and medium-sized companies (Guenterberg & Kayser, 2004).

The Mittelstand plays a vital role in Germany's education system. Over 80% of young people in apprentice programmes are educated and trained in Mittelstand enterprises. *"This is the great accomplishment of the Mittelstand in our country. And therefore it is important, that the economic policy is not only made with the view to large companies"* states Braun (2005, p. 13), President of the German Chamber of Industry and Commerce (DIHK).

The Federal Government of Germany is aware of the importance of the Mittelstand to economy and society, as the policy for the Mittelstand (Mittelstandspolitik) is an integral part of economic policy. The Mittelstand will be strong, innovative, creative and will invest in the future. As it is perceived as the engine for growth and employment, the Government is committed to support the Mittelstand with policies, regulations and programmes such as (Bundestag, 2001):

- Action programme Mittelstand; introduced August 2000 at the Expo in Hannover; several activities in favour of SMEs; programme to be further developed with SME representatives
- Reduction of taxes and duties; tax reform 2000 with lower taxes 2000 until 2005 for the Mittelstand by €11.8 billion; several reform activities reducing costs and duties for the Mittelstand by € 16.7 billion between 1998 and 2005
- Financing of the Mittelstand; e.g. in 2001 € 14.2 billion interest reduced loans to the Mittelstand (ERP programme, KfW Bank and DtA Bank)
- Promotion of self-employment; e.g. information programmes for school children; training programmes for individuals planning to start a company
- Facilitate succession in SMEs; annually around 6,000 SMEs (2.0% of total count) are closed because no successor is found; information platform and bourse called "NEXXT" for companies needing successors and potential buyers
- Education and training; several programmes to promote education and training in SMEs
- Innovation support; various programmes for promoting and funding research, development and certain technologies
- Support of new information and communication technologies; e.g. funding of 24 regional e-commerce competence centres

- Internationalisation of the Mittelstand; e.g. support for participation in foreign trades shows; export credit guarantees
- Reduction of bureaucratic constraints; e.g. improvement of data exchange procedures between companies and government offices
- Improvement of infrastructure; a.g. new freeways, improved rail system

On January 11, 1995 the Federal Government assigned a coordinator for the Mittelstand, whose major task is to coordinate the Government activities regarding policies for the Mittelstand in order to achieve the highest level of synergies from the individual measures (Bundestag, 1995).

The German Forum for Associations (Deutsches Verbaende Forum) lists over 12.000 association and organisations in Germany. In the data base, 1962 associations supporting or representing Mittelstand affairs are listed in Germany (Verbaende, 2006). Some important association are:

- Arbeitsgemeinschaft Mittelstaendischer Unternehmen e.V., Berlin
- Bundesverband Deutscher Mittelstand e.V., Duesseldorf
- Bundesverband Mittelstaendische Wirtschaft Unternehmerverband Deutschlands e.V., Berlin
- Mittelstands- und Wirtschaftsvereinigung der CDU/CSU, Berlin

Supported by the German Government, several universities institutes research Mittelstand issues, which demonstrates the importance of the Mittelstand to German society. Universities with a Mittelstand faculty or research institutes are:

- University Mannheim, Institute for Mittelstand Research
- University of Applied Science for the Mittelstand, Bielefeld; with German-Chinese Institute for Mittelstand
- University Lueneburg, Institute for Mittelstand Research
- University Bayreuth, Research Center for Mittelstand Affairs

The Government does its best by supporting every aspect of the Mittelstand, but there is much room for improvement. Criticism and requests are constantly brought up by Mittelstand companies and associations representing it. Wodok (2004, p. 4) states: *“If promises made by politicians during election years were kept, one group would feel as if in cockaigne: the Mittelstand. Year after year the politician from all parties overreach themselves with new promises..... They have to be reissued every time because they are never realised or are diluted after the election”*. Hansmann (2004, p. 2), President of Floetotto, a Germany manufacturer and direct marketer of furniture, complained: *“The*

politicians care primarily about the big companies, for the Mittelstand, nothing is left". His company almost went bankrupt in 2002: he made the turnaround without help from the Government and politicians.

The Mittelstand is the backbone of Germany's economy and its key employer. The German Government has realised this fact and introduced supporting programmes. Numerous associations represent the Mittelstand affairs and Universities are researching on social and economic Mittelstand issues. The economic section manufacturing will now be introduced.

3.6 The economic section manufacturing in Germany

Enterprises in the European Union are allocated to so-called economic sections. These sections are defined in the Statistical Classification of Economic Activities in the European Community (NACE Rev.1.1, 2002). In the 1990s, a thorough revision of international statistical classifications was carried out and, to some extent, they have been harmonized to a global classification (ISIC) under the lead of the United Nations (Eurostat, 2006). The current classification of economic sectors is depicted in Figure 3.2.

Detail	
+ A	Agriculture, hunting and forestry
+ B	Fishing
+ C	Mining and quarrying
+ D	Manufacturing
+ E	Electricity, gas and water supply
+ F	Construction
+ G	Wholesale and retail trade; repair of motor vehicles, motorcycles and personal and household goods
+ H	Hotels and restaurants
+ I	Transport, storage and communication
+ J	Financial intermediation
+ K	Real estate, renting and business activities
+ L	Public administration and defence; compulsory social security
+ M	Education
+ N	Health and social work
+ O	Other community, social and personal service activities
+ P	Activities of households
+ Q	Extra-territorial organizations and bodies

Figure 3.2: Economic sections in the EU, NACE 1.1

Source: Eurostat (2006)

Manufacturing is one important economic sector (sector D). *"The manufacturing activity is the mechanical, physical or chemical transformation of materials, substances or components into new products. The materials, substances or components transformed are raw materials that are products of agriculture, forestry, fishing, mining or quarrying as well as products of other manufacturing activities"* as stated in Eurostat's definitions (Eurostat, 2006a, p. 10). The manufacturing sector is split into fourteen subsections (DA to DN) ranging from the manufacture of food product, textiles, wood, paper, chemicals, metals to machinery and equipment.

According to the statistics from Germany's Federal Statistics Office, VAT statistics and calculations by the IfM, 285,120 enterprises (9.4% of total count) have been counted in Germany's section D in 2002 (Table 3.5). These companies realised a turnover of over € 1,520 billion (c. 63% of Germany's GDP) in 2002. SME companies account for almost 98.9% of all enterprises in this sector, making 27.3% of the total turnover (Guenterberg & Kayser, 2004).

Section D, manufacturing, represents around 9.7% of all enterprises in Germany and almost 36% of the total turnover of all sections. If only SME enterprises are considered, section D amounts to 9.7% of all German enterprises and 23.8% of the turnover of all sections. In 2003, the manufacturing section in Germany employed 6,937,910 people (c. 16.3% of Germany's total workforce). The share of SME employment (SMEs up to 249 employees) was 51.4%, for enterprises, with 250 to 499 employees 13.5% and for LSEs with 500 and more employees 35.1%. This confirms the importance of this economic section and the importance of SMEs (Guenterberg & Kayser, 2004).

Size of enterprise 1)	Turnover 1) (E/Year)	Enterprises 2)		Turnover 3)	
		Number	in %	€ Million	in %
Micro	up to 2 Million	244230	85,7%	86938	5,7%
Small	2 to 10 Million	28084	9,8%	123751	8,1%
Medium-sized	10 to 50 Million	9630	3,4%	205342	13,5%
Large	over 50 Million	3176	1,1%	1105232	72,7%
Total		285120	100%	1521262	100%

1) EU 2005 SME classification 2) Only enterprises liable to VAT with annual turnover exceeding € 16620 3) Excluding VAT

Table 3.5: Enterprises in economic sector “manufacturing” in Germany 2002

Source: Guenterberg & Kayser (2004)

Section D, manufacturing, is the most important industry sector in Germany. More than one third of the overall turnover of all industry sectors is made in sector D. Machinery and equipment are part of this section. This sector will be introduced in the following section.

3.7 The machinery and equipment industry sector in Germany

Machinery and equipment is classified in Eurostat's subsection DK, divisions 29 through 29.72, the so called NACE codes (Nomenclature statistique des Activités économiques dans la Communauté Européenne - General Industrial Classification of Economic Activities within the European Communities). Eurostat defines machinery and equipment as the subsection which “*covers the manufacture of machinery and equipment which independently act on materials either mechanically or thermally or perform operations on*

materials (such as handling, spraying, weighing or packing), including their mechanical components which produce and apply force and any specially manufactured primary parts. This category includes fixed and mobile or hand-held devices, regardless of whether they are for industrial, building and civil engineering, agricultural, military or home use. The manufacture of weapons and special equipment for passenger or freight transport within demarcated premises also belongs to this division” (Eurostat, 2006b, p. 42). Table 3.6 lists all types of machinery and equipment as well as other products such as appliances and weapons assigned to subsection DK.

Subsection DK	Manufacture of machinery and equipment n.e.c.	ISIC
29	Manufacture of machinery and equipment n.e.c.	
29.1	Manufacture of machinery for the production and use of mechanical power, except aircraft, vehicle and cycle engines	291x
29.11	Manufacture of engines and turbines, except aircraft, vehicle and cycle engines	2911
29.12	Manufacture of pumps and compressors	2912x
29.13	Manufacture of taps and valves	2912x
29.14	Manufacture of bearings, gears, gearing and driving elements	2913
29.2	Manufacture of other general purpose machinery	291x
29.21	Manufacture of furnaces and furnace burners	2914
29.22	Manufacture of lifting and handling equipment	2915
29.23	Manufacture of non-domestic cooling and ventilation equipment	2919x
29.24	Manufacture of other general purpose machinery n.e.c.	2919x
29.3	Manufacture of agricultural and forestry machinery	292x
29.31	Manufacture of agricultural tractors	2921x
29.32	Manufacture of other agricultural and forestry machinery	2921x
29.4	Manufacture of machine tools	292x
29.41	Manufacture of portable hand held power tools	2922x
29.42	Manufacture of other metalworking machine tools	2922x
29.43	Manufacture of other machine tools n.e.c.	2922x
29.5	Manufacture of other special purpose machinery	292x
29.51	Manufacture of machinery for metallurgy	2923
29.52	Manufacture of machinery for mining, quarrying and construction	2924
29.53	Manufacture of machinery for food, beverage and tobacco processing	2925
29.54	Manufacture of machinery for textile, apparel and leather production	2926
29.55	Manufacture of machinery for paper and paperboard production	2929x
29.56	Manufacture of other special purpose machinery n.e.c.	2929x
29.6	Manufacture of weapons and ammunition	292x
29.60	Manufacture of weapons and ammunition	2927
29.7	Manufacture of domestic appliances n.e.c.	293
29.71	Manufacture of electric domestic appliances	2930x
29.72	Manufacture of non-electric domestic appliances	2930x

Table 3.6: Classification subsection machinery and equipment DK

Source: Eurostat (2006b)

In German, the word “Maschinenbau” is used for the “manufacture of machinery and equipment”. The “German-English Technical and Engineering Dictionary” (De Vries & Herrmann, 1966, p. 686) translates “Maschinenbau” as “*machine construction, machine-building industry, constructional engineering, engine building, engineering construction and mechanical engineering*”. Under the term Maschinenbau (i.e. manufacture of machinery and equipment), products ranging from simple components (such as a ball bearing) to complex equipment (such as a newspaper printing machine) are included.

The word “machine” derives from the classical Greek word “mechane” (μηχανή) which was a pulley-like device like a crane used in the Greek theatre for the entrance of an actor representing a god (Latin “deus ex machina”) (Anon, 2003).

3.7.1 History of machinery and equipment industry sector

Figure 1.3 briefly depicts the history of machinery and equipment over time.

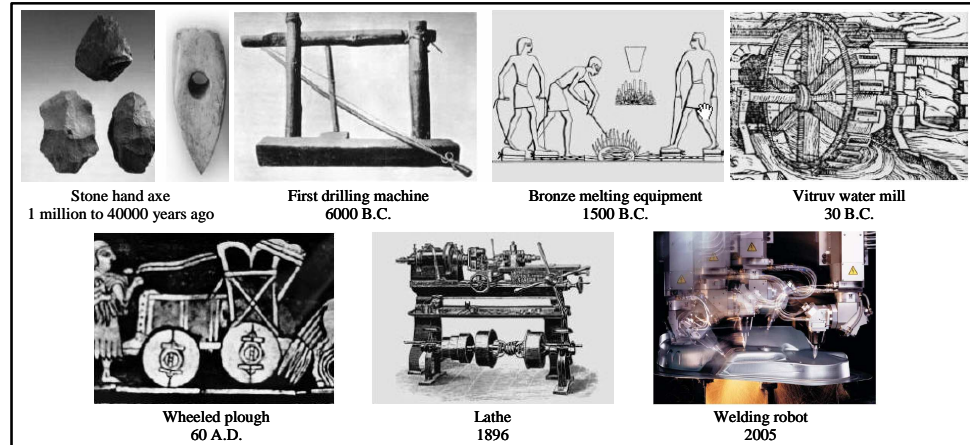


Figure 3.3: Machinery and equipment over time

Source: VDW (2005)

- 1,000,000 – 40,000 B.C.: It began approximately one million years ago with a tool, a hand axe made from stone, which the early human beings invented and learned to use it for hunting and handcrafts such as cutting wood.
- 40,000 B.C.: Stone Age people invented a drill to put holes in stone tools, so that wooden shafts could be attached.
- 6,000 B.C.: A wooden bow with chord (fiddle) was attached to a stone drill and the first drilling machine was available.
- 3,900 - 2,650 B.C.: Copper and bronze appear on the scene bringing new technologies and kind of tools to mankind.
- 1,500 B.C.: With the discovery of iron some better, longer lasting tools and weapons could be produced.
- 30 B.C.: The Roman inventor Vitruvius designed and built the first water mill.
- 60 A.D.: Wheeled ploughs were in use.

Modern inventions began with the invention of the first printing press with moveable type by Johannes Gutenberg in 1445 and, with the invention of the steam engine by Thomas Newcomen in 1711, the industrial revolution began in Britain. In 1812, the first steam ship cruised on the river Clyde between Glasgow and Helensburgh (Spur, 1991). Since the start

of mechanisation in the early nineteenth century and the subsequent boom in metal working, countless tools, machines and engineering equipment were invented worldwide: the new age of modern “Maschinenbau”, manufacture of machinery and equipment began.

At the end of the nineteenth century, when emerging industrial economies such as Germany were beginning to export, Great Britain attempted protectionist measures. After the British “Merchandise Marks Act” (1887), German products had to be marked “Made in Germany”. The act, however, backfired: “Made in Germany” became an internationally recognised and valued label for quality. In the twentieth century and, especially after World War II, the “Maschinenbau” became one of Germany’s most important industrial sectors representing innovation and worldwide export (Bauer, 2003).

Throughout history, “Maschinenbau” was the driving force not only for technological advance but also for economic health. This sector will be further advanced by inventors and entrepreneurs as is evident from the innovation of nano-technology, the new technology of tiny machines (Rees, 2004).

3.7.2 Facts and figures for the machinery and equipment industry sector

According to the VDMA statistics handbook (VDMA, 2005) in 2002 Germany’s machinery and equipment industry sector accounted for about 6,051 enterprises and realised a turnover of € 132.6 billion (Table 3.7). This represents 2.1% of the amount of enterprises, 8.7% of the turnover in the economic section manufacturing and 3.1% of all industry sectors. This industry sector provided work for 906,000 employees and invested € 4.3 billion which is 3.2% of the annual turnover. The export rate in 2002 was over 68% and in 2004, 71.6%. This is the highest rate of all industry sectors, followed by the motor vehicle industry (57.9% in 2004). The overall German export rate in 2004 across all industry sectors was 25.5% of the total turnover (IDW, 2005).

Fact	Unit	Year 2002	Year 2003	Year 2004
Number of enterprises	No.	6051	5948	ca. 5940
Employees	1000	906	885	868
White collar	1000	376	372	368
Blue collar	1000	531	513	500
Partially unemployed	1000	25.2	29.1	16.9
Turnover	€ Billion	132.6	132.5	142.7
Turnover / employee	€ Thousand	146	150	164
Production	€ Billion	128.1	128.4	136.5
Capacity utilisation 1)	%	84.8	82.1	85.9
Productivity 2)	change in %	1.2	-0.9	4.5
Export	€ Billion	87.5	87.2	97.8
Import	€ Billion	32.2	32.3	33.8
Domestic market supply 3)	€ Billion	72.8	73.4	72.5
Export rate 4)	%	68.3	67.9	71.6
Import rate 5)	%	44.2	43.9	46.6
Investments	€ Billion	4.3	4.2	n.a.

1) Values June respective year, Western Germany

2) Production per used hour

3) Production minus export plus import

4) Export in % of production

5) Import in % of domestic market supply

Table 3.7: Facts and figures machinery and equipment industry sector

Source: VDMA (2005)

The machinery and equipment industry sector is represented by certain associations. The largest association is the VDMA (Verband Deutscher Maschinen- und Anlagenbau e.V. - Association of German Machinery and Equipment Manufacturers), founded in 1890, whose headquarters are in Frankfurt/Main. This organisation offers the largest network for the sector in Europe. Around 3,000 member companies (50% of the total number of companies in machinery and equipment sector in Germany) with 20,000 specialists are registered. The 400 VDMA employees lobby Government offices regarding policies for labour market, education, taxes, R&D, financing, international trade, environment and energy. They provide services in the areas of market intelligence, statistics, foreign trade, export, law, regulations, management, information systems, e-business and R&D (VDMA, 2006).

The VDMA cooperates with the VDW (Verein Deutscher Werkzeugmaschinenfabriken e.V. - Association of German Machine Tool Manufacturers), founded in 1891 which also has its headquarters in Frankfurt/Main. The VDW represents the sub-sector 29.4 manufacturers of machine tools in Germany and has 110 member companies (VDW, 2006).

The VDMA classification of the manufacture of machinery and equipment sector is not fully harmonized with the NACE 1.1 classification. The manufacture of domestic appliances, electric or non-electric, is not part of the VDMA classification listed in Table 3.8 (VDMA, 2005). These products are part of the electro-techniques and data processing equipment industry sector.

Agricultural machinery	Mining machinery
Compressors, compressed air / vacuum equipment	Plastic and rubber machinery
Construction / construction material machinery	Power machines
Drive systems and components	Printing / paper production equipment
Elevators and moving staircases	Processing machinery and equipment
Fire brigade equipment	Precision tools
Fittings	Robotic / automation systems
Fluid pumps	Saves and security containers
Foundry equipment	Smelting and milling equipment
Foodstuff / packaging machinery	Testing machines
Furnaces and Burners	Textile machinery (except dryers)
Garment / leather production machinery	Weighing machinery
General pneumatic equipment	Welding equipment (except electric)
Hydraulic / pneumatic systems	Woodworking machinery
Machine tools	Other machinery and equipment
Material handling / conveyor systems	

Table 3.8: VDMA classification of section manufacture of machinery and equipment

Source: VDMA (2005)

3.7.3 Importance of the machinery and equipment sector to German economy

For centuries, the invention, design and manufacture of machinery and equipment has been one of the major driving forces for technological and economic progress. Without the vast number of devices, tools, machines and equipment invented and produced over of time mankind would have remained in the Stone Age. The cost efficient production of quality goods and foods, the supply of energy, the transmission of information, transportation systems for people and merchandise, the maintaining and improvement of personal health and many other things would be unthinkable without machines.

Manufacture of machinery and equipment is of strategic importance for Germany's and Europe's economy. It is a constant source of innovation, progress and wealth. Wiechers (1995, p. 8) states: *"It is no coincidence that internationally successful industrial nations such as the United States of America, Japan and Germany at the same time host the largest production of machinery and equipment"*. On the other hand, he links the downfall of Great Britain's economy with the decline of British industry sector "Maschinenbau". Emerging industries in countries such as the Tiger economies of South East Asia, China and Eastern Europe know the key role that the machinery and equipment industry plays and they continuously expand this section (Wiechers, 1995).

Apart from some exceptions, the machinery and equipment sector exclusively supplies investment goods to other enterprises. Machines and equipment are geared to allow the production of new consumer goods, increase the production capacity or make existing production more efficient. In 2004, this industry sector has increased the turnover to € 142.7 billion (Table 3.7) which is about 6.47% of Germany's gross domestic product (GDP) in this year. In 2003, the rate was 6.12% of the GDP (IDW, 2005). This is an increase of 5.7% from 2003 to 2004, thus making this industry sector one of Germany's most important growth sectors.

The export rate (Table 3.7) is also impressive. It peaked in 2004 with 71.6% of this section's overall turnover, rising from 61.9 % in 1999. The export of machinery and

equipment to the EU was 46.8%, to other European countries 12.1%, to North America 11.7%, to Latin America 3.4%, to Africa 2.6%, to Asia 21.6%, to Australia and Oceania 1.3% and to unspecified countries 0.5% (VDMA, 2005). Exports have been, and still are, one of Germany's most important sources of wealth (DIHK, 2009). However, not only Germany benefits from its exports of machinery and equipment as many countries throughout the world trade with Germany selling material, goods and products and, in return, import machines and equipment from Germany. Modern machines and equipment make the economies of these trading countries more productive, which benefits all. This principle of the mutual benefit of trade was already described by Adam Smith, one of the founders of modern economics, as he states *"It is a maximum of every prudent master of a family, never to attempt to make at home what it will cost him more to make than to buy. The tailor does not attempt to make his own shoes, but buys them from the shoemaker. The shoemaker does not attempt to make his own cloths, but employs a tailor."* (Smith, 1776, p. 62). This principle still applies to modern trade between nations.

The importance of the machinery and equipment industry sector is also shown by the employment figures. According to the VDMA classifications and statistics (VDMA, 2005), the manufacture of machinery and equipment is the industry sector providing the highest rate of employment within the economic section manufacture. In 2004, the employment was 868,000 representing 15.0% of economic section manufacture. In 2004, the second largest industry sector automotive employed in 797,000 persons representing 13.7%.

In 2003, the community of enterprises in the machinery and equipment industry sector educated and trained around 67,000 trainees in their vocational programmes. This amounts to 7.6% of the overall employment in this sector. In 2003, the companies spent an average € 19,029 per trainee which comes to a total of approximately € 1.27 billion and made a massive contribution to Germany's education system (VDMA, 2005a). Without this commitment, thousands of young people would be unemployed, without professional education and without a reasonable prospect for their future.

Expenditure for research and development in 2003 has been about € 4.5 billion, which is about 3.4% of the total turnover in the machinery and equipment section (VDMA, 2005a). In Germany, some € 53 billion have been spent on R&D in 2003. This figure represents about 2.5% of Germany's GDP. Enterprises spent some € 37 billion, universities € 9 billion and government and non-profit private organisations € 7 billion. Per capita, over € 600 has been spent in 2003 (BMBF 2005). The rate of R&D in this industry sector of 8.9% of Germany's total R&D expenditures is an assurance of quality of products, efficiency and leadership in technology, from which all stakeholders benefit.

The machinery and equipment sector is characterised by a dynamic product policy: it offers over 17,000 different products with a renewal rate of around 20% per year. Between 1995 and 1997, about 26% of all patents registered came from enterprises and institutions related to it. Many new products and processes have been patented especially from the

hydraulic, pneumatic, printing and paper machinery, milling and textile machinery sub-sectors (Wuellner & Pollak, 2002).

Machinery and equipment for environmental technologies such as air pollution reduction, recycling and water purification play an important role in Germany's economy and society. These technologies help to make the air and rivers cleaner and contribute to the health of the citizens and recycling technologies and equipment help to preserve natural resources. The market for environmental technologies worldwide is rising. In 2003, the turnover in this area was € 3.1 billion with an export rate of 55%. German technology is leading the world market with the USA and Japan, (VDMA, 2006a).

Another extremely important emergent technology sector is machinery and equipment for renewable energy, e.g. wind energy machines, solar equipment, bio-energy equipment (VDMA, 2006b). Energy has become very expensive lately. The price for crude oil rose from January 2005 to January 2006 from US\$ 45 to 65, an increase of more than 44% (Spiegel, 2006). It is very likely that oil and gas will become more expensive in the future. Emerging economies, such as China and India, who are hungry for energy which increases demand, but worldwide reserves for oil and gas are shrinking (News, 2009). Based on the current demand, known reserves will last for another 60 (oil) and for 40 years (gas) (Ginsburg et al., 2006). Without the exploration of new energy resources, the future progress of mankind will be impossible. New technologies delivered by the machinery and equipment industry sector can help to avoid the ultimate energy crisis. Biomass, wind, water and solar electricity are the future energy resources (Alt, 2004).

3.7.4 Challenges to the machinery and equipment sector in the context of national business environment

For years, there has been continuing controversy about the advantages and disadvantages of Germany as a location for industry and investments. Foreign investors, institutions or leaders value Germany as a place of investment more than those located in Germany. Germany and its economy enjoy, in general, respect and appreciation (Diekmann & Pool, 2005).

There are many studies and rankings published every year. The World Economic Forum in their Executive Opinion Survey came up with rank 6 for Germany behind USA, Finland, Denmark Switzerland and Sweden and followed by Singapore, Hong Kong, UK and Japan. The World Bank gives Germany rank 21 when considering the business environment (Storbeck, 2004). In 2005, Ernst & Young (2005) carried out a research study and interviewed 672 foreign, internationally active companies. According to this study, Germany's rank is 5, behind China, USA, India and Poland.

Germany has much to offer to its enterprises and those interested and willing to invest here. Attributes and major advantages most valued are (Little, 1994; European Commission, 2004; Statistisches Bundesamt, 2006; IDW, 2006; BMW, 2008):

- Political, economic and legal stability
- Large market of 82,468,000 people and a workforce of 42,554,000 persons (51.6% of total population)
- Large community of 3,019,000 enterprises
- Favourable location in the centre of Europe
- Comprehensive, efficient infrastructure (highways, rails, waterways, telecommunication)
- Favourable market structures that allows fast distribution of goods
- A good education system as well as a qualified and motivated workforce that allows productive, high quality level production
- Low strike rate of 4 days average per 1,000 employees between 1994 and 2003 in all industry sectors; other countries: Spain 234, Finland 118, Ireland 73, USA 44, UK 24, Poland 9, Switzerland 3, Japan 1
- Access to new technologies via R&D institutions
- Investment promotion programmes

However, there are also factors which hinder companies investing in Germany and which also encourage enterprises to leave Germany. These environmental factors are challenges for all enterprises and, in particular, those in the machinery and equipment industry sector. Enterprises, business leaders, associations and politicians in favour of the industry constantly and publicly complain or lobby government institutions and demand improvements for the following shortfalls in Germany's business environment (Stege & Weinspach, 1990; Clemens & Kokalj, 1995; Hartung, 2003; Althaus, 2004; Lauk, 2004; Sinn, 2004; Wodok, 2004; Becker, 2005; dimap, 2005; Bundesrechnungshof, 2005; Fischer, 2006; IDW, 2006; Mittelstand Direkt, 2006):

- Inflexibility of the labour market is a major disadvantage in Germany's business environment. E.g. a law which dictates rules for dismissal of employees makes it difficult and expensive for enterprises to lay off people if required. On the other hand, this law (Kündigungsschutzgesetz) makes companies reluctant to employ people if demand rises. The average weekly hours of work were reduced by union demands from 45.7 in 1960 to 38.0 in 2000 (16.8%) (Sinn, 2004). In the machinery and equipment sector, the regular weekly hours of work in the western part of Germany are 35 and in the eastern part (i.e. the new federal states created after

reunification) 38. This, in addition to a high number of vacation days, mean, that Germans work only 1,661 hours in the west and 1,725 in the east per year in comparison with 1,920 in the USA and with 1,811 in Japan. In the western part of Germany, this has resulted in a reduction of annual working hours by 22% from 1955 until 2004 (IDW, 2006).

- High labour costs are a major challenge to the labour intensive machinery and equipment industry sector. In the manufacturing section, the average labour cost per hour in 2004 was € 27.60 (Western Germany). Worldwide, this is only surpassed by Denmark with € 28.14. In the USA, the average hourly costs in 2004 were €18.76, in Japan € 17.95, Hungary € 4.53, Czech Republic € 4.59 and Poland € 3.29. About 44% of Germany's hourly rate consists of supplementary costs, such as social security contributions and vacation bonuses. The supplementary personnel costs are the highest worldwide (IDW, 2006).
- The inflexibility of the labour market and high labour costs are the direct result of union power and are also blamed for Germany's high unemployment rate, which was 9.7% in 2004. From the early 1960s until today, excessive wage demands, in addition to other benefits, such as additional holidays, has resulted in less work for the same wages (Sinn, 2004). IG Metall, founded in 1881, the largest and most powerful union in Germany with 2.4 million members, represents the employees in the machinery and equipment industry sector and in other sectors, such as manufacturing (IG Metall, 2006).
- The German Works Council Constitution Act of 1972 (Betriebsverfassungsgesetz) regulates employee participation in enterprises. Employees are entitled to participate in decision processes as regards layoffs, overtime, extensive organisational changes etc. Company employees can demand that a works council (Betriebsrat) be established. Once established, it has one representative in a company which has 5 to 20 employees, while enterprises with 301 to 600 employees may have a works council with 9 members, one of whom is a full time representative (Stege & Weinspach, 1990). Most members of the works council have union membership. As potential investors do not regard the Works Council Constitution Act with appreciation, German enterprises and institutions demand that it be improved: one proposal is that a works council should only be established in a company with 20 employees and another is that a full time works council member should only be appointed if the company has more than 500 employees (Lauk, 2004).
- Although the rate has come down from 64.9% in 1995 to 38.7% in 2004, the overall tax rate for enterprises in Germany is a constant source of complaint. Japan's rate (40.9%) and the USA (39.9%) are in the same position, whereas in

Ireland, the tax rate has been reduced from 40.0% in 1995 to 12.5% in 2004 (IDW, 2006).

- Germany's tax laws, probably, form the world's most comprehensive, complex and non-transparent tax system: there are 180 different tax laws, some 96,000 administrative rules and regulations and 185 different forms. In the last legislative period alone, 58 changes have been made to existing tax laws. Althaus (2004, p. 1), Prime Minister of the Free State of Thuringia, blames the German tax system as an *"obstacle to growth, investments and new jobs, especially for the SME community"*.
- At the end of 2004 the Federal Republic of Germany (including Federal States and Communities) owed a total amount of € 1,395 billion debt, which is still rising. The Federal Government's debt grew from € 860.2 billion in 2004 to € 888.0 (1.0%) billion which is about 71.6% of GDP (Statistisches Bundesamt, 2006a). In 1995, German debt rate was 57% of GDP. In comparison, the debt rate in % of GDP in Ireland is 29.9%, in the UK 46.3%, in the USA 66.4% and in Japan 161.1% (IDW, 2006). The high German debt rate and the annual increase of more than 3%, which does not meet the EU currency stability criteria, does not leave enough monetary flexibility for Germany and leads to constant increases in taxes. In 2007, the Germany Government increased VAT from 16.0 to 19.0% (IDW, 2006).
- Wodok (2004, p. 8) calls Germany's 2,197 laws, 46,779 specifications, 3,131 regulations with 39,197 individual instructions *"its Angina bureaucracy and subject to a world record"*. Enterprises are frustrated by the number of different declarations, certifications, forms and statistics to be filled out and submitted on a regular basis to all kind of governmental administrations. According to a survey, carried out in 1995 by the IfM Bonn, annually 34.6 hours (2.1% of total annual hours) average per employee had to be spent by German enterprises for administrative services required by governmental institutions. SMEs with up to 9 employees spent an average of 61.9 (3.7% of total annual hours) and enterprises with 100 to 499 employees spent 10.0 hours (0.6% of total annual hours) per employee and year (Clemens & Kokalj, 1995). Enactments, such as the Work Place Regulation demand that SMEs with six or more employees must have separate toilets for men and women and that SMEs with eleven or more employees must have a separate lounge for coffee and lunch breaks, mean that enterprises would rather not hire a sixth or an eleventh employee so that relocation and substantial costs can be avoided (Wodok, 2004). Germany's economic performance could be enhanced by € 30 billion by a radical reduction in bureaucracy from which the labour market, especially SMEs, could benefit (Mittelstand Direkt, 2006).

- The reluctance of both German government and people to reform not only economic, but also social legislation is a major handicap in Germany's business environment, as is shown by the result of a 2005 survey of 1,270 German SMEs regarding pros and cons of Germany as a business location (Becker, 2005). Politicians in power do not have the stomach nor the power to begin root and branch reforms, while opposition leaders, unions and other lobbyists know how to dilute such proposals. Moreover, the German people themselves are still not prepared to support extensive changes in legislation as they have become used to the benefits of the "*Sozialnation*" (nation of social caring) and therefore share the responsibility for its failure (Hartung, 2003, p. 1). In 2005, Infratest dimap, a German institute for opinion research, carried out a survey on Hartz IV, the reforms carried out in the last legislative phase of the Schroeder Administration. 82% of the German citizens surveyed, voted against the reform package, saying it will widen the gap between the poor and the rich (dimap, 2005). In 2005, for the first time in history, Germany's federal budget allocated more than 50% to social benefits, such as pensions and unemployment payment (Bundesrechnungshof, 2005).
- From 1994 – 2004, the German population increased by only 0.2% year on year. In the same period, the annual growth of the population of the USA was 1.1%. Low growth in population is an obstacle to economic growth and economic power (Fischer, 2006).

In the last ten to fifteen years, Germany has lost some ground in global competitiveness, which has been caused not only by lack of strategic thinking and courage to implement reforms, but also by the immense financial burden of reunification (Bach & Vesper, 2000). Porter (1990a) describes four determinants of national competitive advantage: 1. Factor conditions, 2. Demand conditions, 3. Related supporting industries and 4. Firm strategy, structure and rivalry (Figure 3.4). These determinants create the context in which enterprises in a nation can be set up, act and compete locally and worldwide.

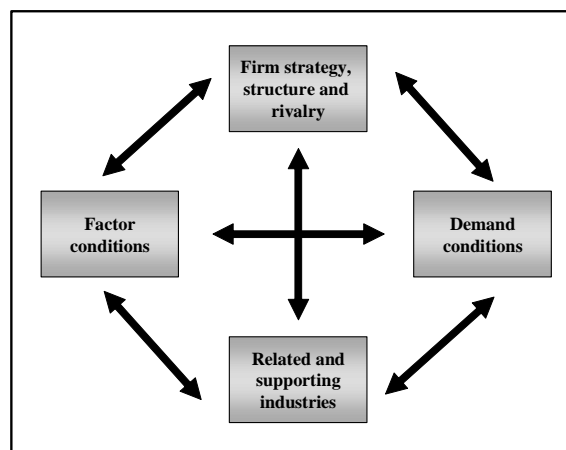


Figure 3.4: Determinants of national competitive advantage
Source: Porter (1990a)

Factor conditions are the parameters of the nation's business environment such as its infrastructure and labour market. Demand conditions are the features of a country's home market for products and services. Related and supporting industries are the supplier base for enterprises. Firm strategy, structure and rivalry are the conditions in a nation for companies to be started up and managed as well as the way they cooperate and compete with each other.

Encouraging signals have come from the new Government which came to power in October 18, 2005. Michael Glos, the Minister for Economics and Technology introduced the annual economic report 2006 in a press conference on January 25, 2006. He addressed necessary reforms in the social system and labour market, the overdue turnaround in the country's finances, the promotion of innovation and investments, the strengthening of the "Mittelstand", reduction of bureaucratic regulations and improvement in energy politics (Glos, 2006).

3.7.5 Challenges to the machinery and equipment sector in the context of global business environment

However, there are other determinants besides Germany's national factor conditions, which challenge the machinery and equipment industry sector.

A special challenge is the shortage of electrical and mechanical engineers, which may hinder innovation and growth in this sector. Young people prefer to study other disciplines (Leimbach, 2005). Between November 2000 and February 2001, a research project regarding innovation in the machinery and equipment sector was carried out by IMPULS, Stiftung fuer den Maschinenbau (Foundation for Machinery and Equipment). Questionnaires were returned by 319 enterprises. About 40% of these enterprises mentioned that shortages of engineers and other specialists hinder their innovation process substantially. Companies consider this as the biggest obstacle to innovation (Harhoff et al., 2001).

The IMPULS study also revealed that enterprises suffer from the high cost of innovation and consider this as an obstacle. The costs of innovation have to be borne immediately and cash flows from innovations come later. Thus, companies have to find ways to finance innovations. Smaller companies and those with lower profitability or low equity capital ratio have more problems in coping with the high costs of innovation (Harhoff et al., 2001).

The machinery and equipment industry sector is highly dependent upon the global economic business cycles. Fluctuations hit this sector first and harder than other industry sectors. Companies do not invest or even cancel options and orders as soon as economic indicators suggest a decline and they start to invest only when the order books are full again. This customer behaviour requires more flexibility as well as a sophisticated early

warning system in the machinery and equipment sector than in other industry sectors (VDW, 2005).

The high export rate of 71.6% (in 2004) in the machinery and equipment sector (VDMA, 2005) also means a greater exposure to currency fluctuations. From 2001 until the end of 2005, the US Dollar, the most important currency for global exports, fluctuated from 0.838 to 1.362 against the Euro. In comparison with the Dollar, the Euro became more expensive by over 62% (comdirect, 2006), see Figure 3.5. During that time, products exported to countries working with US \$ and paying in Euros became more expensive at the same rate. This resulted in prices pressure, reduction on the price level and thus decreased margins. For exports in foreign currency to countries with a floating currency, hedging against fluctuations is an important measure to reduce uncalculated risks (Société Banque Suisse, 1984). On the other hand, hedging of exchange rates, such as options, futures, foreign currency credits, swaps, factoring or Hermes Government guarantees result in extra costs (Wittstock & Dahrenmoeller, 1984).

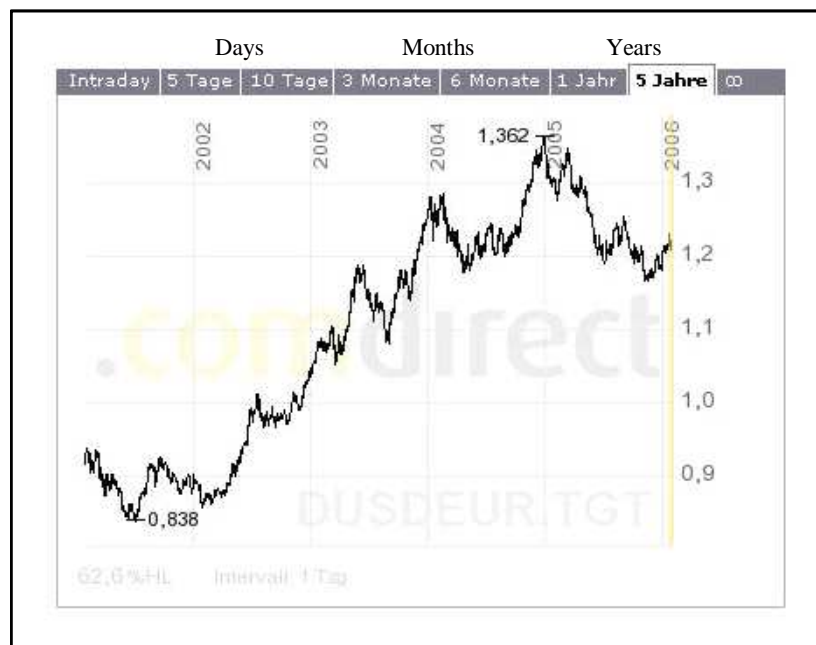


Figure 3.5: Fluctuation of the US \$ to € over 5 years

Source: comdirect (2006)

Rising steel prices, exploding energy costs and high labour costs, as well as the strong Euro have caused an erosion of profitability. According to the VDMA, the return on sales (ROS, profit before tax / turnover) in the machinery and equipment sector in 2003 was about 3.4% (VDMA, 2005a). This figure of 3.4% also represents the average ROS over the last fifteen years. It is too little for future challenges and substantial innovations.

Overall worldwide competitiveness has suffered. Schnitzler (2005) reports that, in 2004, about 500 enterprises (c. 8% of the total population) in the machinery and equipment sector went bankrupt and it is expected that this number will rise again. According to surveys by the Deutsche Bundesbank (= German Central Bank), eroding profits or losses have led to a low average equity capital ratio of 25% in this sector. One third of the

enterprises have an equity capital ratio of less than 10%. These companies lack the strength for investments and innovations and are not prepared for unexpected, unfavourable changes and challenges in the global environment (Schnitzler, 2005).

At the end of 2006, the so called Basel II equity capital agreements took effect. Banks giving loans to enterprises are required to assess the credit risk. They can ask a company to be rated by an independent agency or they can carry out the rating on their own. Equity capital, liquidity and profitability are some of the most important rating parameters (Braun & Schaefer, 2005). Low values for these factors result in a poor rating, higher risk classification and higher interest rates for loans. In addition, banks have to deposit a greater rate of their own equity capital for loans to enterprises with a higher credit risk. This has led to the trend that banks prefer low risk companies and refuse loans to those with a poor rating and high credit risk (Braun & Schaefer, 2005; Wehran, 2004). Enterprises with lower profitability or low equity capital ratio have problems to find partners for financing their innovation projects (Harhoff et al., 2001).

The capital costs of SMEs are higher than those in LSEs. SMEs do not have the leverage to negotiate favourable bank loan conditions as LSEs have and usually no access to the international capital markets for direct loans (Wossidlo, 1990).

In 2005, about 71,000 SMEs (c. 2.4% of total count) with almost 680,000 employees were estimated to have been transferred in Germany to new owners such as family members, employees, external executives and investors. In 46,500 (c. 1.5% of total count) enterprises (444,000 employees) the reason for transfer was the age of the owner. About 5,900 (c. 0.2% of total count) companies with 33,500 employees had to be shut down in default of a successor (Kayser, 2004). This situation is similar in all industry sectors. Some owners, who are unable to realise that the time has come to step back, neglect succession planning (Gruhler, 1998). In emergency situations, e.g. if the owner becomes ill suddenly and is unable to run the business, there is no-one available who is qualified to succeed. A study carried out in Baden-Wuerttemberg revealed that in SMEs with more the 20 employees, almost half of the owners and executives have no emergency succession plan (Ballarini & Keese, 2002). This is especially true in medium-sized family owned enterprises, as family members may have different opinions on who should succeed and cannot resolve the succession conflict among themselves (Boes & Kayser, 1996).

Since 1978, after political reform, development and change in China have been fast and far-reaching: Chinese economic power has reached a new level with the development of an open economy. Its GDP has grown on average, over the last twenty-five years, by 9.4% (Canrong, 2005) and its export into the world market reached a new peak in 2005 with an export surplus of US\$ 102 billion (Spiegel, 2006a). There is a large demand from China for machinery for the production of the consumer goods which it exports worldwide and therefore it is, currently, an ever expanding market for German machinery and equipment manufacturers. With growth rates around 30% in the last years it has become the third largest export market (Bitzer et al., 2004; Impuls, 2007). However, China is aware of this

sector's importance and is now manufacturing its own. It has now become the world's forth largest producer of machinery and equipment and is striving to improve that position in the international markets (Bitzer et al., 2004). For German producers, competition with Chinese manufacturers will be the biggest challenge in the future. Chinese companies are still behind in quality, technology, management and export market expertise, but they learn quickly and are financially strong. They are also ready to take over German companies to get access to know-how and innovation (Bitzer et al., 2004). Labour costs are small compared to German standards. The average annual salary in Chinese companies in the manufacturing industry was 12,496 RMB/Yuan (1,336 EUR) in 2003 (VDMA, 2005b). Since 2005, China has increased its investment in R&D by around 20% annually to 1.3% of the GDP. It took Germany fifty years to reach a R&D rate of 2.5% of GDP (Wirtschaftswoche, 2005). Moreover, manufacturer of machinery and equipment in Germany have suffered from plagiarism by Chinese competitors. Hesse (2008) states that four of five German companies in the machinery and equipment sector have already become a victim of Chinese plagiarism. Parts, components and even complete machines have been copied and copies of German machines are sold at a much lower price in international markets. A manufacturer for ball grinding machines went bankrupt after Chinese copies of his machines undermined his business (Schnitzler, 2005a). Baron considers plagiarism as part of China's business model (Baron, 2005) and Sieren (2005) considers China's rise as Germany's decline and suggests strategic adjustments. As a consequence, companies no longer register most of their inventions as patents, since Chinese companies obviously consider patents as a source of information for plagiarism.

India's economy and manufacturing industry is also growing fast. From 1999 until 2004, GDP grew by an annual average rate of 5.8%. Currently, India is the world's largest laboratory for software development. In the machinery and equipment sector, India's enterprises are still behind those in China, but its people are eager to learn and to work hard. Centres for the manufacturing of machinery and equipment have been built up in Bangalore and Ahmedabad (Koehler et al., 2006). It is just a matter of time before India becomes another competitor for German manufacturers. Economists forecast increased economic growth and performance in both India and China (Figure 3.6) whereas it is expected that both Europe and Japan will be the losers in the world share of economic power (Koehler et al., 2006; Steingart, 2006).

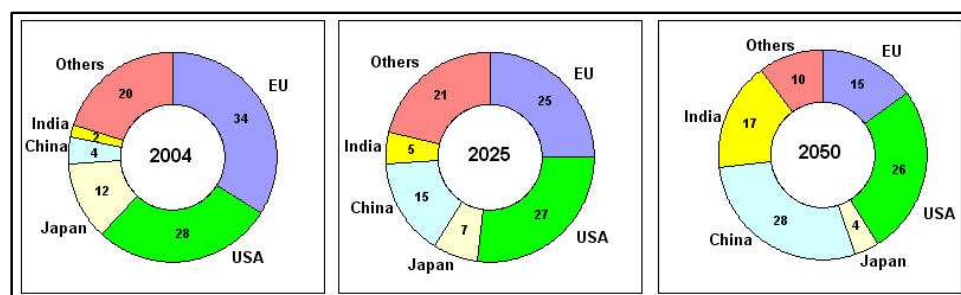


Figure 3.6: Economic performance in the world 2004, 2025 and 2050

Source: Koehler (2006)

The emergence and advancement of China, India and other nations within Eastern Europe is part of continuing “globalisation”. Hamer & Hamer (2005, p. 11) consider globalisation as a new “*world dimension*” and other economists see it as “*a new era of global economy*” i.e. the transition from the regional economy to the national, from the national to the supranational and finally to the global economy. This process is fostered by technological achievements in aerospace, logistics, telecommunication and new media such as television and the internet. Globalisation is not an economic issue, but also a technological, political, social, cultural and military one (Hamer & Hamer, 2005). Germany’s machinery and equipment industry sector has benefited from globalisation for decades, but now the German SME community and, in particular, its machinery and equipment sector, have to deal with new, competent competitors worldwide and are challenged by the effects of globalisation (Fieten et al., 1997).

According to a research study by the German management magazine “Impulse”, published in 2003, over 61% of German SME leaders interviewed (1,043), generally saw risks for their enterprises rather than opportunities. In 2001, the same study showed that 57% saw risks in globalisation (Impulse, 2004).

3.7.6 The role of the engineer in the machinery and equipment research sector

Human resources and, in particular, engineers play an important role in the technology driven machinery and equipment sector. In Germany, there has been a shortage of engineers for some years. Companies, especially smaller SMEs in the machinery and equipment sector have difficulties in recruiting engineers for research, development, or production. In 2009, about 73,000 jobs offered for engineers (11.4% of engineers employed) remained vacant (Spiegel, 2007).

China, with 1.3 billion citizens, has extensive human resources. Annually around 3 million (0.2% of total population) students receive a university diploma, 325,000 (0.25‰ of total population) engineers graduate and 360,000 000 (0.28‰ of total population) PhD dissertations are approved. In Germany 30,000 (0.36‰ of total population) engineers graduate each year (Braun, 2005). The Chinese government plans to double the numbers of graduating students by 2010. The MBA degree is highly regarded in China (Wirtschaftswoche, 2004).

With regard to technology in the machinery and equipment sector China follows two strategies: firstly “*the catch up strategy*”, secondly “*the quantum leap strategy*” (VDMA, 2007, p.1). One key element of the strategy is the improved education of engineers at Chinese universities (Ihrcke, 2007).

In the machinery and equipment management sector positions are dominated by engineers. As depicted in Figure 3.7, about 64% of the top executives and 56% at the vice president level are engineers. A good half of both populations are mechanical engineers (VDMA, 2007a)



Figure 3.7: Engineers in management positions

Source: VDMA (2007a)

Figure 3.8 shows the distribution of different engineering faculties in the machinery and equipment sector. Mechanical engineers dominate (52%), followed by electrical engineers (19%).

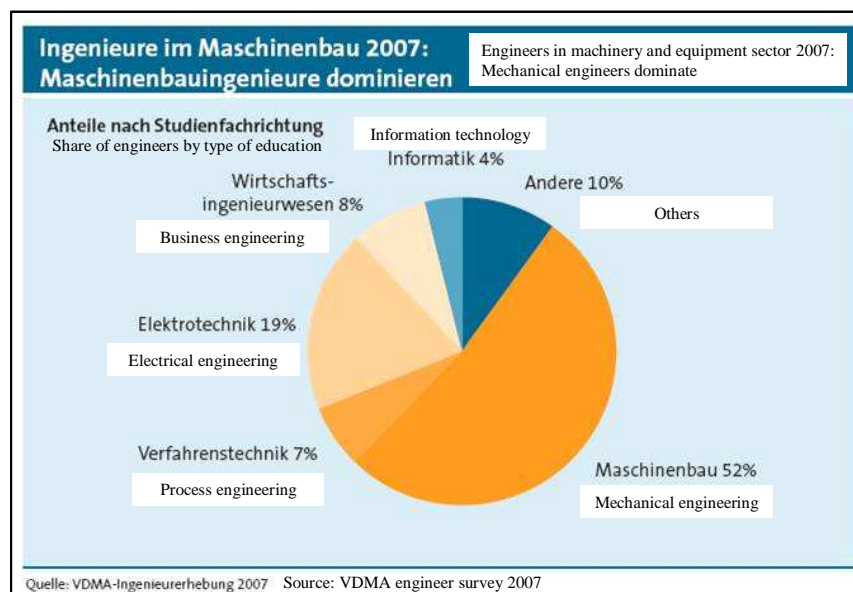


Figure 3.8: Engineering faculties in machinery and equipment sector

Source: VDMA (2007a)

3.8 Summary

This chapter has provided comprehensive information regarding the community of small and medium-sized enterprises (SME) in Europe and Germany. SMEs play a vital role for the economy and society as they offer jobs to the majority of working people (European Commission, 2004; Guenterberg & Kayser, 2004). Politicians in the European Union and Germany have realised the importance of the SME and started initiatives to support SMEs

and to facilitate their future success (European Commission, 2005c; Bundestag, 2001). The chapter goes on to introduce the manufacturing sector and in particular the machinery and equipment sector in Germany and discusses challenges this sector is faced with in the national and international environment. The chapter concludes with the discussion of the role of engineers in the machinery and equipment sector in which management positions are dominated by engineers. In the context of this research project, this raises the question regarding the level of management education of engineers.

In the following reasons and justifications for selecting the machinery and equipment industry sector as the research sector are listed:

- Very high importance to German and European society and economy.
- Major challenges ahead that require sound strategic management.
- This industry sector went already through a massive structural crises in the years 1991 – 1994 (Zechlin, 1995). Have the lessons been learned?
- This sector is dominated by engineers.
- Management education of engineers is neglected.
- The researcher is an engineer and has many years of insider knowledge and experience.

Figure 3.9 summarises the issues and conclusions drawn, the contribution to the research project made with this chapter and research questions arising.

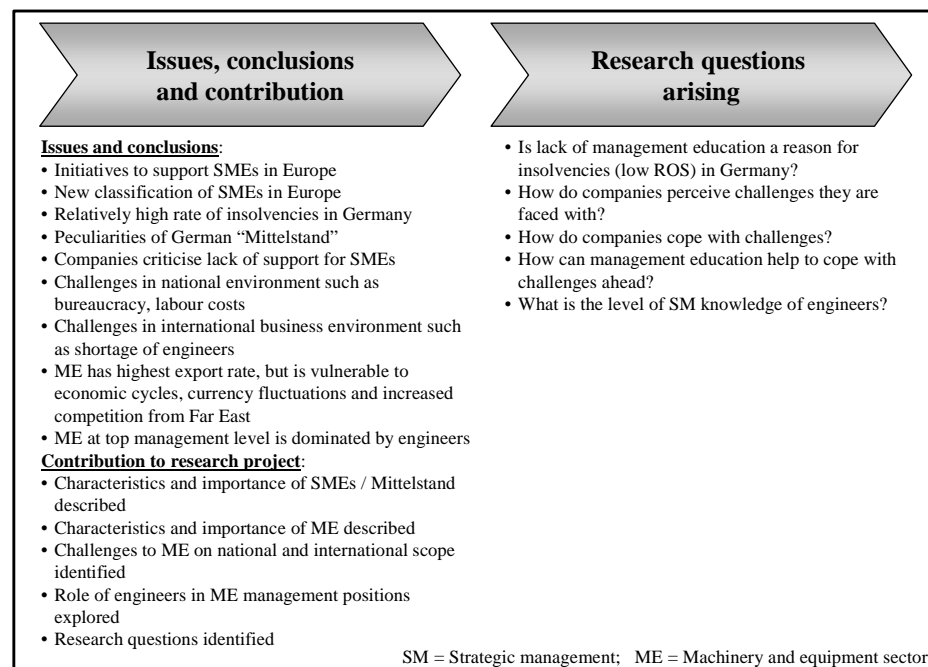


Figure 3.9: Chapter contribution and summary

Source: Developed by researcher

The next chapter highlights empirical studies, reports and papers on the state of thinking and management in German SMEs and, in particular, the machinery and equipment sector.

4 Previously published research results and empirical studies regarding the German SME community and research sector

“Innovation is the creative destruction of the existing by entrepreneurs.”

Joseph Schumpeter (Quoted in Handelsblatt, 2005, p. 64)

4.1 Introduction

Chapter 3 introduced the European and German SME community as well as the German machinery and equipment sector.

Figure 4.0 list the objectives for this chapter.

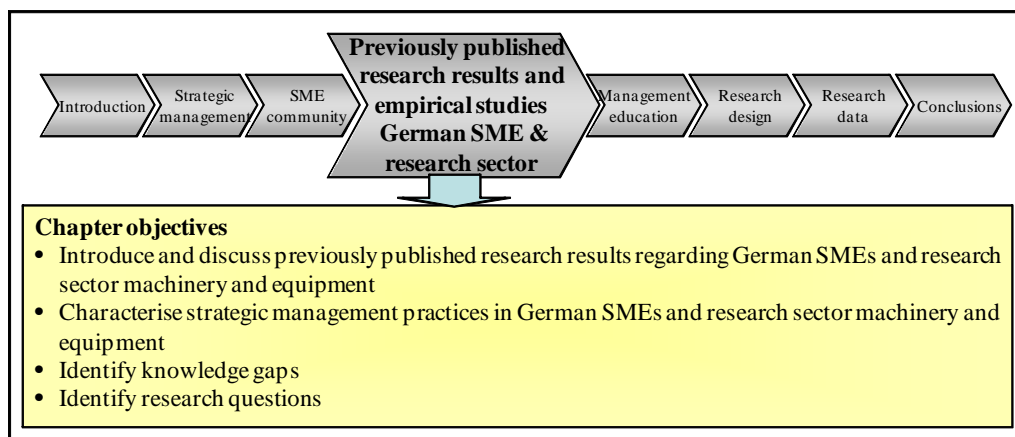


Figure 4.0: Objectives chapter 4

Source: Developed by researcher

This chapter introduces previously published research results, empirical studies, statistical analyses and publications on the subject of strategic management in German SMEs covering functional areas operations, HR, marketing, R&D, finance, as well as on the company level. These studies and papers were published within the last twenty years by the IfM Institute for SME Research, universities, associations and consulting companies and those are structured chronologically and by functional areas. They describe the state of strategic management on the functional levels and company level and characterise strategic thinking and behaviour of the German SME community and, specifically, the machinery and equipment sector. At the end of each section, the research results are briefly summarised.

4.2 Research results regarding operations strategies and concepts in SMEs

The following section introduces previously published research results, empirical studies, statistical analyses and publications regarding strategies in the functional area of operations management of German SMEs. The research results are listed in chronological order.

4.2.1 Flexibility of SMEs, (Geiling, 1982)

Geiling (1982) carried out a comprehensive literature research and empirical study on the subject “Contribution of small and medium-sized companies to the technological progress”. 221 enterprises participated in the study. Geiling discovered that SMEs are less bureaucratic than LSEs, their administration does not lag and the leaders or owners take decisions fast and independently. This gives SMEs a greater flexibility and speed in the competitive environment and compared to LSEs. However, there are also negative aspects with which SMEs have to cope: the owners’ views may be blinkered or (Hamer, 1990; Hofmann, 2004) lacking in foresight (Kriegbaum, 1995a; KFW, 2004; BDU, 2005) and resources may be inadequate (KFW, 2004).

4.2.2 Investment decisions process in SMEs, (Hamer, 1990)

Research studies in 1983 and 1987/88 revealed that SME executives make investment decisions not only for profitability, but also for personal or family criteria. Almost 20% of the SME executives responding mentioned that investment decisions were made, depending upon their own health and the availability of a successor. Decisions are preferably made on a short-term and medium-term perspective, not theoretically, but on their own practical and concrete market assessment (Hamer, 1990).

4.2.3 IT systems utilisation, (Schaefer et al., 2002)

According to a study published in 2001 by the German Ministry of Economics, German SMEs have caught up in the adoption of modern information technology. Of the 2,300 SMEs surveyed in Germany, Finland, United Kingdom, Italy and USA, it was found that about 86% of the German SMEs used e-mail, 89% the internet, 44% intranets, 8% video conferencing and 39.5% e-business. In comparison with the other countries surveyed, German SMEs were average users, whereas Finland headed the table of IT utilisers (Schaefer et al., 2002).

4.2.4 Make or buy concepts, (VDMA, 2005a)

The largest association in the industry sector machinery and equipment VDMA (Verband Deutscher Maschinen- und Anlagenbau e.V. - Association of German Machinery and Equipment Manufacturers) carries out an annual survey among its around 3,000 member companies (50% of the total number of companies in machinery and equipment sector in Germany) and publishes the results are published annually with the so called “Kennzahlenkompass” (compass of key figures).

One trend observed is that a growing number of its member companies, for reasons of cost and for the recruitment of additional resources, buy more components and reduce their own manufacture. According to key figures (VDMA, 2005a), around 80% of the enterprises currently deal with make-or-buy concepts: and the share of bought components rose from 51.0% in 2000 to 54.8% in 2003.

Section summary; operations:

- (Geiling, 1982): SMEs strive for lean organisation and administration, as well as flexibility and speed.
- (Hamer, 1990): Personal implications and family criteria influence the process and outcome of important decisions. Decisions are preferably made on short-term or medium-term perspectives. SME leaders base decisions more on practical, pragmatic and concrete assessments rather than theoretical assessments.
- (Schaefer et al., 2002): German SMEs are average users of modern IT and communication technology compared to SMEs in other European countries, such as Finland.
- (VDMA, 2005a): There is a continuing trend for German SMEs in the machinery and equipment sector to outsource manufacture of parts and components. The underlying strategy is the reduction of vertical integration in favour of cost advantages.

4.3 Research results regarding human resources strategies, concepts and leadership behaviour in SMEs

The following section introduces previously published research results, empirical studies, statistical analyses and publications regarding strategies and leadership behaviour in the functional area of human resource management of German SMEs. The research results are listed in chronological order.

4.3.1 Leadership versus management concepts, (Hamer, 1990)

From empirical studies, Hamer (1990) derived that the leadership methods are similar in SMEs and LMSs. However, the relationship of the management with the workforce in SMEs is more personally-orientated than in LSEs. In SMEs, leadership competence is considered more important than management methods. Hamer considers the ability of the leader to communicate his own passion for the work of the enterprise to the employees as the best leadership method in SMEs.

4.3.2 Human resource development, (Acker, 1995; Schaefer et al., 2002)

Vocational training and further education of personnel plays an important role in Germany's SMEs and is part of their business strategy of SMEs. Acker (1995) states that the SMEs in the machinery and equipment sector have learned that investment in employee training and qualification is necessary to maintain a competitive edge.

Statistical research published indicates that every other SME offers vocational training and 87% of SMEs with 50 to 249 employees provide access to further educational programmes. However, the number of personnel in SMEs who have had an academic education (6.1%) is smaller than in LSEs (12.8%). On the other hand, the rate of participation in general and job specific education programmes and seminars is higher in small companies (41%) compared to LSEs (38%) (Schaefer et al., 2002).

4.3.3 Employee participation concepts, (Schaefer et al., 2002)

A survey of more than 9,000 German SMEs has shown that the rate of employee participation in company profit and equity is larger in LSEs. SMEs with 10 to 49 employees participate 7.0%, SMEs with 50 to 199 employees 15.5% and 200 to 499 employees 17.7%. LSEs with 1,000 or more employees participate beyond 30%. Numerous empiric investigations have shown that employee participation is a motivational factor and stimulates willingness to perform (Schaefer et al., 2002). In this, SMEs still have to catch up.

4.3.4 Succession planning, (Hofmann, 2004)

Hofmann (2004) states that succession planning is a general problem in SMEs. Statistical research indicated that, between 2001 and 2004, around 300,000 SMEs needed a successor, or a new owner, or a manager. Misinterpretation of the situation, postponement, family quarrels and generational conflicts often lead to problems in the succession of SME ownership or management. The importance of this is underestimated: this may be the reason that only 5% of SME companies survive beyond the third generation after the founder.

4.3.5 Human resource policies and instruments, (Walz, 2005)

After the recession of 1991 – 1994, which hit the machinery and equipment sector badly (Zechlin, 1995), companies re-orientated their HR policies and instruments (Walz, 2005). New organisational models were developed, continuous improvement programmes such as Kaizen (Imai, 1992) introduced, processes improved, new remuneration and working time models defined and the leadership style and business culture adjusted to induce a higher

rate of motivation, trust and partnership with employees. Walz (2005, p. 251) cites the holistic re-orientation of a pump manufacturer which claims: *“We shall reach employee orientation, customer orientation and process orientation; our objective is to be the number one in quality, lead time, price, innovation and service”*. Companies realised that creativity, ideas and performance of the employees lead to success and competitive advantage (Walz, 2005).

4.3.6 Sickness leave: indicator for good leadership practices, (VDMA, 2005a; Braun, 2005a)

The annual survey (VDMA, 2005a) of almost 3,000 of its member companies indicates a sickness absence level of 3.5%, in 2003, in the machinery and equipment sector. Compared to the national level of 4.9%, this level is low and may indicate more employee satisfaction and motivation in this sector.

Braun (2005a) states that a low sickness level is an indicator of good leadership practices and high motivation. Empirical studies have indicated that the success factor in cost and time has an improvement potential of around 5% by deploying cost reduction programmes and process optimisations. This is very little in comparison with the success factor in human resources. A sound human resource strategy, employee health programmes, motivation, innovation, creativity and empathy can improve the company's success by about 50%.

4.3.7 Motivation level, (Vogel, 2005)

A study in 2004 by Gallup, the US management consulting company, showed that only 12% of the employees in German enterprises are fully motivated and committed. Around 70 % just do their job and 18% are generally de-motivated. On the other hand, 88% of the employees long for motivation and an opportunity to fully engage in the workplace. The annual financial loss to German companies, due to less motivated employees and thus loss of performance and productivity, is estimated by Gallup at € 220 billion per year (Vogel, 2005). As indicated above, poor leadership practices, but also lack of direction, lack of strategy and lack of company success may be a major reason for this loss of wealth. A holistic approach to management may release huge potential in German enterprises.

4.3.8 Employee commitment, (IFAK, 2007)

In a study in 2006, carried out by IFAK (2007) (Institut fuer Markt- und Sozialforschung), 1,978 employees of German SMEs were interviewed. About 63% of the interviewees indicated that they feel a modest commitment to their employer. About 22% mentioned that they have no or little commitment to the company they work for. Only 15% of the

interviewees indicated that they have a strong commitment to their employer. The research study shows clearly that employees with a high commitment have a lower sickness level and vice versa. Employees with little commitment had an average of 9.3 days of sick leave per year (4.5% of total annual working days), while employees with high commitment had only 5.9 days of sick leave (2.8% of total annual working days). In addition, the research study discovered that employees with high commitment provided more suggestions for improvements and vice versa. Employees with a high commitment made an average of 19.6 suggestions and employees with little commitment only 8.9 suggestions. The report concludes with suggestions for improvement such as creating a favourable working environment and employee development.

Section summary; human resources:

- (Hamer, 1990): SME leaders pay more attention to their employees and have a better relationship to the work force compared to LSEs. SME leaders and owners strive to communicate their enthusiasm for their enterprise to the workforce.
- (Acker, 1995; Schaefer et al., 2002): SME leaders in the machinery and equipment sector know the importance of employee qualifications for the success of the enterprise. They invest in training and qualification such as the German vocational training programme. Compared to LSEs, SMEs employ a lower rate of staff with academic qualifications.
- (Schaefer et al., 2002): Compared to LSEs, SME are reluctant to allow employees to participate in company profit or equity.
- (Hofmann, 2004): Family owned SMEs have difficulties in succession planning. The importance of a smooth transition from one generation to the next is underestimated. Family quarrels and generational conflicts often lead to problems.
- (Walz, 2005): After the severe recession in 1991 – 1994, when many SMEs in the machinery and equipment sector had problems, the management re-orientated their HR policy, instruments and leadership style to a more employee orientated approach. The companies have realised that employee satisfaction and motivation is vital for the success of the company.
- (VDMA, 2005a), Braun (2005a): The sickness level in the machinery and equipment sector is below the national level. This may be a result of the re-oriented, improved HR practices in this sector after recession in the early 1990s.
- (Vogel, 2005): A favourable, holistic human resource strategy can result in a much higher payoff than programmes for cost reduction and process optimisation.
- (IFAK, 2007): There is evidence that the employee motivation level in German companies is low. Reasons are poor leadership practices and lack of direction and strategy. A holistic approach to management is suggested. There is evidence that

employee satisfaction and motivation are related to the level of sickness leave and the number of suggestions made.

4.4 Research results regarding marketing strategies and concepts in SMEs

The following section introduces previously published research results, empirical studies, statistical analyses and publications regarding strategies in the functional area of marketing of German SMEs. The research results are listed in chronological order.

4.4.1 Marketing system, (Albach, 1983)

Based upon empirical studies, Albach (1983) characterises the marketing system in German SMEs:

- Product
 - SMEs usually cover niche markets; the market volume in that area suits SMEs, but not LSEs.
 - Many SMEs analyse customer complaints and, from that, innovation and product improvements are derived.
 - Product innovation and development play an important role in SMEs.
- Communication
 - Marketing communication is usually under-developed in German SMEs as, on an average, they spend less than 1% on advertising.
 - Personal contact to the customers, often by the owner himself, plays an important role.
 - Participation in trade fairs is common in German SMEs.
- Pricing
 - SMEs usually do not sell at a low price. If they do, or are compelled to do it, it often ends in financial problems.
 - SMEs have advantages in their cost structure compared to LSEs.

4.4.2 Marketing awareness and organisation, (Pfohl, 1990)

Resulting from several empirical studies, Pfohl (1990) criticises the lack of marketing awareness in German SMEs: most of them do not have a strategic marketing plan as SMEs

usually think that marketing programmes are especially designed for LSEs. They cite the lack of qualified personnel and are unaware that marketing, marketing strategy and marketing mix can be practiced, regardless of the size of the enterprise. Other weak points in the organisation are related to lack of marketing awareness. About 73% of companies with more than 500 employees have an organised sales department, but the figure for SMEs is only about 47%. About 75% of companies with more than 500 employees have an organised marketing department, but the SMEs have only a figure of about 20%.

4.4.3 Marketing strategies and concepts, (Frese, 1995)

As noted previously, the machinery and equipment sector is the highest of all industry sectors in exporting worldwide with a level of over 71% (VDMA, 2005). This level will be hard to maintain and will be even harder to increase. Marketing strategies and concepts to foster existing markets and to develop new ones will be more important in the future. The world market is the target (European Commission, 2004; Frese, 1995). However, smaller SMEs may not have the resources to cover all possible markets. They should select and concentrate their resources on the most important and lucrative markets (Frese, 1995).

4.4.4 Marketing intelligence, (Harhoff et al., 2001)

In a research study, in 2001, carried out by the VDMA and Inno-tec the Institute for Innovation Research and Technology Management of the Ludwig-Maximilian-University, Munich, 319 companies responded. The study revealed that lack of market intelligence is the most important obstacles to innovation. Around 19% of the responding enterprises considered lack of market and competitor information as an obstacle to innovation. Harhoff et al. (2001) state that companies in the machinery and equipment sector need to improve their access to market information.

4.4.5 Added value by service strategies, (VDMA, 2005a; Kriegbaum, 1995)

Manufacturers of machinery and equipment enrich their product portfolio through additional services. In a 2001 survey, about 95% of the respondents in the machinery and equipment sector considered additional services to be a very strong element (43.9%) or strong element (50.9%) in the competitive environment and to be an important factor in the customer decision buying process. In 1999, this figure stood at 93% (VDMA, 2005a).

Kriegbaum (1995) argues that additional value for customers in the machinery and equipment sector can be reached by the following accompanying services:

- Technical planning and consulting

- Machine set-up or assembly at customer site
- Training of customer personnel
- Technical documentation
- Development and supply of accompanying software packages
- Maintenance, inspection and repair
- Leasing of machines and equipment

4.4.6 Pricing behaviour, (VDMA, 2005)

Statistical research on the machinery and equipment sector carried out by the VDMA (2005), revealed that the manufacturers of machinery and equipment in Germany were able to increase their price level moderately by an annual rate of 1.0% to 1.5% between 1997 and 2004 in order to compensate for the inflation rate.

4.4.7 Marketing promotion, (VDMA, 2005a)

The VDMA (2005a) surveys frequently carried out among the around 3,000 member companies revealed that, in 2002, an average of 1.5% of the total turnover was spent in marketing promotion. Smaller companies have a higher level than large companies. The average absolute budget for marketing promotion was € 1.329 million. In detail, 43.1% was spent on general advertising, 41.4% on fairs and exhibitions 9.3% on sales promotion and 6.4% on public relations. About 97% of the companies evaluate and track their success rate at fairs and exhibitions. The internet is considered as an important marketing communication tool: 92% of all enterprises have their own home page.

4.4.8 Market dynamics perceived, (Ernst & Young, 2005a)

In 2005, about 80 successful entrepreneurial German SME companies, competing for the award “Entrepreneur 2005”, were surveyed in a research study by Ernst & Young, in cooperation with the “F.A.Z. (Frankfurter Allgemeine Zeitung)” and the University of Klagenfurt, Austria. The survey dealt with how companies perceive market dynamics and competitive forces (Ernst & Young, 2005a; Porter, 1985). Market rivalry, or competition was considered to be the most important factor by (86%) of the companies surveyed, followed in importance by market entry barriers (73%) and then by customer bargaining power (70%). A very low percentage of the companies (23%) thought the bargaining power of suppliers was important and even a lower number (17%) considered the use of product substitution to be of consequence.

Section summary; marketing:

- (Albach, 1983): The marketing system of German SMEs is characterised:
 - SMEs usually follow a market niche strategy.
 - SMEs have close relations with their customers, learn from them and derive innovation from their suggestions.
 - Marketing communication is often under-developed in German SMEs.
 - SMEs are less inclined than LSEs to promote sales with price reductions.
- (Pfohl, 1990): There is a lack of marketing awareness in German SMEs. Most of them do not have a strategic marketing plan.
- (Frese, 1995): In light of the growing competition in the Far East, marketing strategies and concepts have become more important to SMEs in the machinery and equipment sector.
- (Harhoff et al., 2001): There is lack of marketing intelligence in the machinery and equipment sector. This is considered as an obstacle to innovation.
- (VDMA, 2005a; Kriegbaum, 1995): German manufacturers of machinery and equipment enrich their product portfolio with additional services. This provides more value to the customers and gains a higher customer loyalty.
- (VDMA, 2005): German manufacturers of machinery and equipment apply modest price increases. They were able to raise the prices to compensate for the inflation rate.
- (VDMA, 2005a): The largest sum of the annual marketing communications budget is used for participation in exhibition and fairs.
- (Ernst & Young, 2005a): SMEs consider the competition in the market, market entry barriers for the competitors and the bargaining power of the customers as the most important market dynamic factors.

4.5 Research results regarding research and development strategies and concepts in SMEs

The following section introduces previously published research results, empirical studies, statistical analyses and publications regarding strategies in the functional area of research and development of German SMEs. The research results are listed in chronological order.

4.5.1 Contribution of SMEs to technological progress, (Geiling, 1982)

In his comprehensive literature research and empirical study on the subject “contribution of small and medium-sized companies to the technological progress”, in which 221 enterprises participated, Geiling (1982) came to the following conclusions:

- The contribution of SMEs to technological progress is higher than the contribution of LSEs.
- SMEs are responsible for the majority of important inventions and innovations.
- SMEs should be more involved in the governmental policies for research and technology.

Geiling (1982) argues that as a result of his empirical research Schumpeter’s hypothesis that only LSEs can assure technological progress is disproved. Schumpeter (2003, 1987) emphasises the importance of LSE for technological progress. LSEs have research departments which assure stable development with continuous accumulation of know how.

4.5.2 Innovation strategies, (Albach et al., 1985)

In 1985, a research project regarding obstacles to growth was carried out: a sample of 463 German “Mittelstand” enterprises with a number of employees between 200 and 2,500 participated. One conclusion was that enterprises are most successful when its entrepreneurs combined the following (Albach et al., 1985):

- Research effort and creativity in the area in which the enterprise has an advantage in technology and products
- Competitive intelligence and imitation of competitors innovations combined with its own innovations

4.5.3 Innovation power of SMEs, (Geschka, 1990)

Based upon empirical research, Geschka (1990) argues that the innovation power of SMEs is not less than that of LSEs. With regard to the innovation power of SMEs, he states as follows:

- SMEs have structural advantages such as smaller overheads and a short decision process. They are able to capitalise faster on new ideas.
- Enthusiastic leaders and owners of SMEs involve themselves directly in the innovation process. They are prepared to take risks.

- SMEs have lower overhead costs and therefore innovations cost less in comparison with LSEs.
- Results from research and development are intensively used within SMEs.
- SMEs are specialised in their technology. The concentration on their niche makes them more sensible and powerful.
- SMEs concentrate the innovation effort on actual market demands and trends.

On the other hand, SMEs have to cope with some structural disadvantages:

- Innovation activities may not be continuous. There may be a considerable time lag between innovation projects.
- There is a lack of methodological know-how regarding innovation management.
- Some SMEs may not have the critical size and volume for a productive innovation management.
- SMEs are mostly too small for interdisciplinary research and development.
- Personnel restrictions often do not allow parallel innovation projects.
- SMEs often do not have the resources for market research and exploring and gathering information on scientific issues and trends.

4.5.4 Innovation process, (Foerderer et al., 1998)

In 1997, the Institut der deutschen Wirtschaft Koeln (Institute of German Economy) started empirical research on the subject of the “Innovation and Mittelstand” in Germany. Over 1,800 SMEs with 10 to 500 employees returned the questionnaire. Around 69% stated that they hold regular strategy meetings or workshops to define new products, services or processes. Around 86% of the companies hold meetings with employees, 34% use creativity techniques, 11% apply evaluation methods and 20% use databases for finding and assessing new ideas (Foerderer et al., 1998). Interestingly, over 94% of the responding companies stated that they use customers as a source for ideas.

4.5.5 Innovation strategies, (Harhoff et al., 2001)

The VDMA study carried out in 2001 with 319 responding companies, already cited above, describes the success factors of innovation management as seen by the responding SME in the machinery and equipment sector (Harhoff et al., 2001):

- Success factor general management: executives spent an average 13% of their working time for development and product innovation; 88.5% of the general managers have an academic background (Diploma 63.9%, PhD 19.2%).
- Success factor innovation strategy: 90% of the respondents of successful enterprises consider the innovation strategy as important; less successful companies 61%; around 85% strive for technological leadership, 68% for market leadership and 32% for cost leadership.
- Success factor innovation structure: 76.2% of the enterprises do their own R&D; 34.5% informally involve customers, 19.0% suppliers and 10.4% universities in the innovation process; 51.3% of the successful companies are involved in marketing, and 33.3% of the less successful; the involvement of the production department is similar (32.5% in successful companies as against 15.3% in less successful companies).
- Success factor innovation process: 36% of the successful companies use a standardised innovation process (idea finding, development, design, realisation, prototyping, market introduction) as against 20.8% in less successful companies. The use of innovation tools (scenario technique, creativity tools, etc.) is further advanced in successful companies.

4.5.6 Partnerships for innovation, (Schmidt & Wossidlo, 2004)

In a paper, Schmidt and Wossidlo (2004) state that SMEs do not influence universities research programmes in their favour as they should. While LSEs continuously articulate their interests for research programmes and provide lists with recommended diploma and doctoral theses, SME are passive. The BM/F Betriebswirtschaftliches Forschungszentrum / Mittelstand (Economic Research Centre / SME) has started numerous initiatives such as presentations, discussion panels, seminars, trainings and papers, etc. to activate SMEs. It, however, has had marginal success.

4.5.7 Strategic innovation management in German SMEs, (Heidenreich & Wimmers, 2007)

The DIHK, Deutsche Industrie und Handelskammer (German Chamber of Industry and Commerce), the umbrella organisation for all local IHK offices in Germany, published an empirical research paper “DIHK Innovation Report 2007”. Their research is based on around 60,000 interviews and consultative meetings, which IHK innovation consultants held, in 2006, with SME company representatives and young entrepreneurs who were starting up enterprises in a technology orientated field. The research paper describes the innovation management of German SMEs as follows (Heidenreich & Wimmers, 2007):

- There is a lack of strategic innovation management (systematic planning, realisation and controlling of ideas); tools such as technology maps are used only in a few companies.
- SMEs concentrate on themselves and their branch; innovation activities in other sectors are neglected and technological trends missed.
- However, SMEs listen to their customers and are customer orientated; often, customer requests directly lead to innovation effort.
- SMEs have growing difficulties in the recruitment of technologically orientated personnel, such as engineers, for their research and development departments.

Section summary; research and development:

- (Geiling, 1982): Contribution to technological progress is rated higher in SMEs compared to LSEs. The involvement of SMEs in governmental policies for research and technology is smaller than in LSEs.
- (Albach et al., 1985): SME enterprises are most successful when its entrepreneurs combined:
 - Research effort and creativity in the area in which the enterprise has an advance in technology and products.
 - Competitive intelligence and imitation of competitors innovations with their own innovations.
- (Geschka, 1990): The innovation power of SMEs is demonstrated as follows:
 - Leaders and owners involve themselves in the innovation process.
 - SMEs are able to realise their innovations faster and at lower costs than LSEs.
 - SMEs concentrate their innovation effort on actual market demands and trends.
 - There is lack of innovation methodology in German SMEs.
- (Foerderer et al., 1998): In the process of innovation, German SMEs hold strategic meetings and workshops and use creativity techniques. Most of the SMEs use customer input as a source of ideas.
- (Harhoff et al., 2001): SMEs in the machinery and equipment sector see general management, innovation strategy, innovation structure and innovation process as vital for their innovation success.

- (Schmidt & Wosidlo, 2004): LSEs are experienced in communicating their research and development interests to universities and other institutions, whereas SMEs are reluctant.
- (Heidenreich & Wimmers, 2007): There is evidence that German SMEs lack strategic innovation management. SMEs concentrate on themselves and their branch and miss technological trends. SMEs have increasing difficulty in the recruitment of technologically orientated personnel.

4.6 Research results regarding finance strategies and concepts in SMEs

The following section introduces previously published research results, empirical studies, statistical analyses and publications regarding strategies in the functional area of company finance of German SMEs. The research results are listed in chronological order.

4.6.1 Financial planning systems, (Wossidlo, 1990)

Based upon empirical results, Wossidlo (1990) argues that the calculation of capital demand and financial planning is neglected in most SMEs. As the SME increases in size, it is more probable that instruments for financial planning are installed. He states that only 14% of SMEs with less than 9 employees carry out regular financial planning. About 43% of SMEs with 200 to 499 employee practice regular financial planning. Start-up companies who applied for government funds and who are compelled to submit a financial plan have a higher survival rate. Based upon his research, Wossidlo (1990) lists the problems in SMEs regarding financial planning:

- In investment planning, only primary investments are covered; consequential or secondary investments such as material stock or receivables are neglected.
- Fiscal related capital demands are ignored e.g. taxes and dues.
- Personal drawings may lead to liquidity problems, especially in companies with more than one owner or general manager.
- The planning horizon is too short which leads to liquidity problems.

4.6.2 Cost effectiveness, (Horváth & Weber, 1990)

Horváth and Weber (1990) analysed the reasons for SME bankruptcies. They argue that insufficient financial instruments, missing cost effectiveness calculations and poor controlling procedures are major reasons for failure. Business leaders in the machinery and

equipment sector are often engineers. They tend to concentrate on innovation and production rather than on financial instruments.

4.6.3 Finance behaviour in SMEs, (Schaefer et al., 2002)

The dependency of SMEs on banking institutions has a long tradition in Germany. The co-operative relationship between the bank and SME is one of trust and longevity. This has benefits for both sides. The bank knows the enterprise and its financial strength. It is more willing to provide loans and grant better conditions Schaefer et al. (2002). Based upon statistical research, Schaefer et al. (2002) characterise the financial behaviour of German SMEs. Compared to LSEs, German SMEs are financed to a greater extent with debt capital. The ratio of bank loans to total equity is above average. Companies with a turnover of up to € 7 million finance their enterprise with 28.6% bank loans in relation to the total equity. Companies with a turnover of € 7 million to € 40 million have a ratio of 22.8% and company with a turnover of more than € 40million 6.6%. This makes smaller SME more vulnerable regarding liquidity problems. In addition, short term debt is more expensive than long-term debt. New instruments of financing, such as private equity capital (Fleischhauer, 2007) and mezzanine capital (Torpey & Viscione, 1987), coming up lately, are accepted by SMEs. Public loans available from the State or Federal Government as well as the EU are often not used because lack of knowledge (Schaefer et al., 2002).

4.6.4 Equity in German SMEs, (KfW, 2004)

Another study was carried out in 2003/2004 by KfW (2004), Kreditanstalt fuer Wiederaufbau; (Bank Group including Bank for the German Mittelstand), Frankfurt, in over 4,500 German companies. About 82.4% of the sample were SMEs with a turnover of up to € 50 million. It is stated that German SMEs still have a relatively small equity ratio in comparison with SMEs in other European countries. In the study, SME leaders were asked if they are striving for a higher equity ratio in their company. About 44% of all companies are striving for a higher equity ratio. Smaller SMEs are less inclined to increase their equity. Note: According to VDMA (2005a), the average equity ratio in the machinery and equipment sector in 2003 was 30.6%.

4.6.5 Finance strategy, (Ernst & Young, 2007)

In 2006, about 100 successful entrepreneurial German SME companies with above average growth, competing for the award “Entrepreneur 2006”, were surveyed in a research study by Ernst and Young (2007), in cooperation with the F.A.Z. (Frankfurter Allgemeine Zeitung). The research results show that the successful companies surveyed apply the following finance strategies:

- The majority of the companies (87%) finance their investments with company profits.
- Every third company looks for alternative financing methods, such as going public.
- 25% of the companies lease equipment and buildings and reduce fixed assets.
- Over 50% of the companies consult their banking partner on improving their financial strategy and financial situation.

Section summary; finance:

- (Wossidlo, 1990): There is evidence that most SMEs neglect financial planning procedures. This has led to liquidity problems.
- (Horváth & Weber, 1990): Business leaders in the machinery and equipment sector are often engineers, who concentrate on innovation and production and neglect financial instruments and controlling.
- (Schaefer et al., 2002): Compared to LSEs, SMEs finance their enterprise to a greater extent with debt capital. Thus the ratio of bank loans to equity is above average. Small SMEs are vulnerable to liquidity problems. Because of lack of knowledge, SMEs often do not apply for public or state loans.
- (KFW, 2004): Compared to European SMEs, German SMEs have a lower equity ratio. Smaller SMEs are less inclined to increase their equity.
- (Ernst and Young, 2007): Successful SME finance their investments with company profit and look for alternative financing methods such as going public, mezzanine capital. They prefer leasing and consult the bank for their investment and finance strategy.

4.7 Research results regarding strategic management practices on the company level in SMEs

The following section introduces previously published research results, empirical studies, statistical analyses and publications regarding strategies on the company level of German SMEs. The research results are listed in chronological order.

4.7.1 Strategy selection, (Albach, 1983a)

Companies apply different strategies to secure their future. Between 1978 and 1982, Mittelstand enterprises in the German states of Baden-Wuerttemberg, Bavaria, Lower Saxony and North Rhine Westphalia with 100 - 2,500 employees were investigated. Three types of strategies were identified (Albach, 1983a):

- The consolidation strategy: Companies with 500 - 750 employees have most difficulty in securing their future. The workforce is reduced and turnover stagnates. With reduced profit, they have difficulties in maintaining their equity and thus increase long-term debt. These companies have reached a critical stage of growth, independent of branch and location. They have a profitability problem which they attempt to solve by reducing the number of employees and by reducing investments. This strategy secures short term liquidity, but does not secure their future.
- The growth strategy: The second type of company uses every means to increase turnover. The objective is to increase market share at the cost of competitors. This strategy, however, results in massive resistance from the market. Prices are reduced and cost reductions and larger lot sizes with respective risks are necessary. This often results in reduced profit, the pressure to substitute expensive labour costs with capital and lower payout to the shareholders. In the long run, the growth strategy pays off only if profitability and productivity can be improved substantially.
- The innovation strategy: Companies applying this strategy invest 50% to 100% more in research and development than do others. They are more innovative and they do more to satisfy the wants and need of their customers. Albach (1983a, p. 8) calls these companies "*the new Schumpeter companies*". Their innovation strategy appears more successful with regard to future security. They have a good growth in turnover and their fixed assets, equity, number of employees, market shares and productivity grow faster than those of other companies.

Based upon his research studies, Albach (1983a) suggests seven rules for successful companies:

1. Do not consider growth as the only successful strategy to secure the future of the company.
2. Be certain that the company's mission and objectives are understood and accepted by all employees.
3. Use all options to acquire and apply new management abilities to meet the challenges of increased complexity. SMEs, especially, have not yet acquired and applied new management abilities.
4. Create a leadership team consisting of all core competences and avoid single person management.
5. Strengthen the willingness of the company to compete internally and externally. Competitive thinking is not only for the salesman, but also for the R&D personnel.
6. Concentrate all resources to the core mission of the company.

7. Follow up the company objectives with obsession and missionary diligence.

With these seven rules for successful companies, Albach suggests a more holistic approach to strategic management

4.7.2 Management systems, (Albach, 1983)

Albach (1983) describes the management system in Germany's SMEs. He divides the management system in SMEs into three categories; the system of objectives, the system of controlling and the system of leadership. He states that the paramount objective of the SMEs is to maintain their independence. To meet this objective, SMEs have to make sufficient profits which can be attained by superior products produced by excellent craftsmen (Facharbeiter = craftsman, a person who has served a three year apprenticeship with a final practical and theoretical examination). Independence, profitability and job security for craftsmen are the three most important objectives. SMEs react more quickly to changes in the economic environment and are faster and more flexible than big companies. Not every SME has planning, budgeting systems and processes for investments. The management system in Germany's SMEs is less formalised. Most enterprises have no leadership principles Albach (1983).

4.7.3 Obstacles to growth, (Geiser, 1983)

Geiser (1983) introduced his empirical study on the topic "Obstacle to Growth in SMEs" with 397 enterprises. He researched the obstacles to growth and combinations of it in all areas of the business; management; procurement; production; marketing; finance; human resources; and location. In 67.6% of the SMEs, obstacles could be traced to the management of the business. As the business increased in size, the importance of the obstacle "management" declined. This suggests that larger SMEs have better management practices and vice versa. In the category of management, the following were the chief obstacles:

- An overworked management
- Lack of knowledge of management practices
- Reluctance to take risks or become engaged in cooperation with other companies
- Problems with continuing education and succession planning

4.7.4 Growth thresholds in SMEs, (Albach et al., 1985)

In the research project in 1985 on growth thresholds in German SME mentioned above, where 463 German Mittelstand enterprises participated, it became evident that the success or failure of an enterprise is basically determined by its own policies and strategies. General conditions such as market conditions or government conditions are only, with some exceptions, of importance. Strategies for products, markets, investments or research and development as well as the methods of leadership and organisation should be defined and individually orientated at the company's abilities and premises (Albach et al., 1985). According to the empirical results, they defined clusters of companies:

- **Successful companies:** These companies are characterised by a superior product-market strategy and innovation. They have a high profit rate.
- **Consolidating companies:** These companies are characterised by a conservative management policy, managers with little dynamism, reduced investments in innovation and market development. They may, if they do not restructure, later fall into the category of companies with continuing crisis.
- **Companies in growth crisis:** The reason for these companies' difficulties are small, or mistaken, investments in markets and in innovation. They follow a quantity strategy accompanied with quality problems and stagnating market shares. These companies have a poor profit rate.
- **Companies in continuing crisis:** These companies are characterised by a lack of leadership, organisation, information and communication structures. They have unclear strategies and objectives and try to turn the company around. This, however, fails, if the whole company policy and strategy is not reconsidered, adjusted and aligned. Often, liquidity and equity are missing to turn these company around with their own resources.
- **Aggressively expanding companies:** These companies run a risky multi-strategy. They invest in the same time in market development, in research and development and production. This approach is only feasible with the ability to get capital for expansion.

4.7.5 Success factors, (Feiland, 1986)

A research study in 1986 on 20 successful German SMEs in the manufacturing business was carried out and revealed the following success factors (Feiland, 1986):

- Good planning and controlling instruments for the surveillance of the success of the management processes
- Orientation on niche market

- High product quality; commissioned production; ability to adapt to individual requirements; a higher price level than less successful companies
- No cost advantage compared to less successful companies; utilisation of rationalisation potentials and employment of up to date systems
- Market orientated innovation; utilisation of customer recommendations and those from their own employees
- Cooperative leadership style with team work and delegation of responsibility; relief of the management from routine work; high motivation level
- Favourable working atmosphere; flexible organisation; little formal rules and regulations; information

Feiland indicates that SMEs have a typical organisational structure with strengths, but also weaknesses compared to large companies. In particular, management practices are a weakness. He defines this as “*management gap*” (Feiland, 1986, p. 35).

4.7.6 Knowledge on management discipline, (Kayser, 1987)

Kayser (1987, p. 15) describes problems in general management in the growth phase of SMEs: “*A growth crisis in many cases is a synonym for a leadership crises*”. In the growth phase, there is not enough basic knowledge on management discipline (Kayser, 1987).

4.7.7 Strategic planning, (Schmidt & Freund, 1989)

Between 1982 and 1986, a research study was carried out and 339 German Mittelstand enterprises in the manufacturing industry sector whose employees numbered 50 to 2,000, participated. Four levels were investigated (Schmidt & Freund, 1989). In level 1 the current success of the enterprises was analysed on the basis of key figures such as profitability. Level 2 covered the normative future orientated (strategic) concept of the companies and answered how the company should manage future challenges. In the third level, it was investigated how the enterprises realised their strategic success factors and what concrete action they took. It became evident that the strategic planning process was neglected in many small and medium-sized enterprises. Strategic plans often did not exist and the planning horizon was shorter than in LSEs. The size of the SME is an important influencing factor regarding the existence and definition of planning systems.

Within the empirical study, ex post, companies were categorised as follows:

- Type 1; innovative top companies

- Type 2; defence-orientated, successful companies
- Type 3; emerging, growth orientated companies
- Type 4; crisis endangered companies

Strategic planning for a minimum period of four years was carried out in 52.0% in type 1 companies and 51.7% in type 3 companies surveyed. In defence-orientated companies, type 2, 32.0% planned strategically. Only 23.5% of the crisis endangered companies had strategic plans. These research results suggest the positive impact of long-term strategic planning on company success (Schmidt & Freund, 1989).

4.7.8 Strategic planning, (Hamer, 1990)

According to Hamer (1990), who produced several empirical studies, SME leaders usually emerge from the practical side of the business and have little or no experience of strategic planning nor any theoretical knowledge of it. Even long-term investments are strategically planned to a smaller extent than in LSEs. Hamer states that management is not only for the present, but also for the future. Companies should prepare the organisation for the future. Strategic planning is a business discipline, which LSEs take for granted. Medium size companies use it to some extent and in certain areas such as marketing, finance, product planning, capacity and investment planning, but other areas, such as human resources, are neglected. Small companies do not strategically plan at all. SMEs are less complex than LSEs, but nevertheless, strategic planning should be part of SME's management portfolio. The more complete the strategic plan, the better and more safely an enterprise can be managed.

4.7.9 Hidden champions, (Simon, 1992)

Simon (1992) introduced the market position of selected German SMEs. He states that these "Mittelstand" companies have a special talent for export and market domination. This generally remains concealed, because their products are used in the manufacturing process or are parts of an end product and thus have little visibility. In addition, they avoid publicity and are not interested in sharing their success strategies with others. Although the German Mittelstand companies defend their privacy, 39 companies participated in Simon's research study. From the information received, Simon derived five common practices German Mittelstand companies apply:

- Combination of strategic focus with geographic diversity
- Emphasis on factors like customer focus
- A blend of technology and closeness to customers

- Reliance on their own technological competence
- Creation of mutual interdependence between the company and the employees

German SMEs focus on craftsmanship, continuous training and a good relationship between management and employees. They demonstrate global leadership by their attention to improvement and their commitment to serving markets. They follow strategies that combine technical competence with worldwide marketing and sales. They focus on their key competences and do not become distracted by diversification strategies. They have confidence in their own abilities and solve technical problems and research and development tasks themselves. Thus, they keep their independence and do not have to share knowledge with others. From a selection of 25 hidden champions, 17 are manufacturers of machinery and equipment.

4.7.10 Management errors, (Zechlin, 1995)

Zechlin (1995) quotes statements made in the media on the crisis of the machinery and equipment sector in the recession years, 1991 - 1994. Enterprises in this sector showed evidence of significant management errors. Companies reacted too late to the recession, neglected strategic alliances and over-emphasised niche policy. German machines were considered over-engineered and too complicated.

4.7.11 Production outside Germany, (Uhlig, 1995; Ackermann, 1995; Heise et al., 2005; Sommer, 2005)

SMEs, especially in the machinery and equipment sector, are active in exporting their products to world-wide markets. However, there is some reluctance to invest in production facilities in foreign countries. In a paper, Uhlig (1995) argues that SMEs should consider direct investment outside Germany. Cost advantages by production in Asia and Eastern Europe may lead to an increased competitiveness. In addition, the facilities in foreign countries can also be used for accelerating market penetration.

In a research paper, Ackermann (1995) argues that the transfer of production may also bear risks and needs patience and financial strength and should be part of a long-term strategy. Initially, labour intensive and technical simple components can be transferred to a partner there to gain experience in that country. Thus, the company can profit from low labour costs.

Some papers have reported on the experience of German companies who started production in Eastern Europe or in the Far East. It was said that companies suffered from lack of quality awareness, lack of flexibility, lack of supply availability and increasing costs for coordination and communication. Some have now returned to Germany after

disappointments, such as the theft of technology and financial disasters (Heise et al., 2005; Sommer, 2005).

4.7.12 Distribution and service in the Far East, (Laier, 1995)

Laier (1995) states that SME companies in the machinery and equipment industry sector are usually reluctant to commit direct investment overseas and also have difficulty in advancing in overseas markets, despite superior products. In 1995, in order to help SMEs in markets such as the Far East, the VDMA, in co-operation with member companies and with support from banks and the State of Baden-Wuerttemberg, set up the Centre for Industry and Trade in Singapore. The Centre acts as a platform for German manufactures of machinery and equipment: shortly after it opened, more than 100 SMEs signed up to it and began building their bridge head to East Asia in Singapore.

4.7.13 Direct investment strategy, (Schmidt et al., 1995)

In a research report, Schmidt et al. (1995) discuss the direct investment behaviour of German SMEs in the production sector. German SMEs in the manufacturing industry and, in particular, machine and equipment manufacturers concentrate too much on export in their internationalisation strategy. They compare SMEs in the United States and Japan with German SMEs. The latter are behind regarding direct investments in foreign countries. Adherence to export dominance may be a disadvantage for German SMEs. Direct investments and world-wide production networks assure a closer presence to the customers. It is suggested that the export strategy be complemented with a direct investment strategy (Schmidt et al., 1995).

4.7.14 Strategy of corporate citizenship, (Maass & Clemens, 2002)

Maass & Clemens (2002) define corporate citizenship as a strategic action concept. It is used to support strategies on the functional level such as marketing strategy, human resource strategy, but also to improve the image and reputation of the company. In the empirical study by the IfM (Institute for SME-Research) Maass & Clemens analysed, in 2001, the corporate citizen activities of 940 German companies, mostly SMEs in the production sector. About 80.6% of companies with up to 19 employees, 95.1% with 20 to 99 employees and 98.5% of companies with 100 to 499 employees engage in corporate citizen activities in the areas of social welfare, culture and education, sport, sciences and environment.

4.7.15 Controlling instruments and early warning, (Kriegbaum, 1995a)

Kriegbaum (1995a) demonstrates the impact of business cycles on SMEs in the machinery and equipment sector, where fluctuating demand is extremely high. Based on his research, he states that companies in this sector have difficulty in managing fluctuating demand in a business cycle. The lack of sufficient instruments of control leads to “*reaction lag*”, i.e. delayed action, to the business cycle (Kriegbaum, 1995a, p. 59). If there is a boom in demand, signs of recession are neglected and in a time of recession, the leaders of the machinery and equipment sector are pessimistic to such an extent that they neglect the signs of business recovery. Thus, valuable time is lost and financial loss cannot be avoided.

4.7.16 Strategies of successful companies, success factors, (Simon, 1996)

Simon (1996) continued to analyse the success factors of about 500 German SMEs. He stated when he introduces his research results: “*They do almost everything differently from what the popular management gurus of our time say and they are still extremely successful*” (Simon, 1996, p. 5). The strategies of these successful companies, “hidden champions”, are:

- Clear and challenging objectives, to become market leaders
- Concentration on markets and competences; avoidance of distractions such as diversification
- Global orientation in the target markets
- Close customer relations, value orientated, not price orientated
- Continuous innovation in products and processes
- Integration of market and technology as a driving force
- Aware of competitors, competitive advantages in quality and service
- Trust in their own strengths, solve problems by themselves, do not believe in cooperation and strategic alliances to secure their own know-how
- More work activity rather than more employees, careful selection of motivated personnel
- Practice of leadership, autocratic in basic values and participative on details, continuity

4.7.17 Strategic planning, (Menke et al., 1996)

A research study carried out in 1996 in German SMEs of certain industry sectors (car recycling, software, biotechnology, etc.) revealed the lack of strategic planning, market intelligence and environmental screening. This is considered a general problem in German SMEs. Menke et al. (1996) suggest considering strategic management not only as long term planning but also as thinking in alternatives, if/then constellations. This is the prerequisite for coping with the socio-economic environment. Systematic environmental screening is important, for instance, if new markets are to be developed and risks avoided.

4.7.18 Strategic management, (Fieten et al., 1997)

In an empirical study, in 1997, 865 SMEs in the machinery and equipment sector, automotive suppliers and electric equipment were surveyed on the “effects of globalisation”. One conclusion was the necessity of a strategic management process. Enterprises should strategically restructure themselves in order to be able to take advantage of the opportunities ahead and to gain freedom of action (Fieten et al. 1997). It is stated that it was empirically proved that successful SMEs are characterised by three major strategies:

- They concentrate on a carefully selected customer base, know what these customers require and know how to meet these requirements.
- They have extraordinary abilities to develop new products and services of high value to their customers.
- They achieve the most effective processes to bind the customers to their product and service portfolio and to develop new markets and channels of distribution; they manage a convincing appearance on the market.

In addition, successful SMEs feature three core competences which cannot easily be copied by competitors:

- Ability to create and communicate a superior customer value
- Superior efficiency in their value chain, especially with their key business processes
- Efficient organisation and management with a compatible business culture to create incentives for the employees; sustainable execution of their strategies

4.7.19 Deficits in management, (Waldmann & Wagner, 2003)

Waldmann & Wagner (2003) quote a survey “Perspective Mittelstand” carried out by “Manager Magazin” in 2003, where 512 enterprises participated. They discovered a serious deficit in management in Germany’s Mittelstand. Leaders often do not take the necessary measures to advance their business. Around 48% pull back to the core business instead of expanding. About 43% put their supplies under pressure to lower the prices for purchased goods and services. About 25% of the SMEs reduce capacity and staff. SMEs often cannot professionally utilise their potential.

4.7.20 Strategies and objectives, (BDI, 2003)

A research study with 1,051 German SMEs was carried out by BDI (2003), (Bundesverband der deutschen Industrie e.V., Berlin, Association of German Industry) and Ernst & Young in March 2003. The importance of different company objectives indicated by the management was evaluated. On top of the list are the security of the (family) enterprise and long-term increase of the company value. Short term profit maximisation plays only an average role. This suggests that leaders of German SMEs are more inclined to have long-term and strategic aims as against short-term perspectives. There are some differences between companies managed by owners who are family members (family enterprises) and those managed by employees who are not family relatives (managed enterprises). Personal objectives, for example, play a more important role for employed managers. The study also revealed that 55% of the companies surveyed do not have written strategies and objectives.

4.7.21 Focused strategy, (Ernst & Young, 2003)

Innovative market and finance strategies, as well as the courage to explore new ways of doing things are important success factors of SMEs, according to a study by Ernst and Young (2003). In 2003, 64 companies qualifying for the “Entrepreneur of the Year 2003”, were interviewed. An important characteristic of successful SMEs is a focussed strategy. Over 50% of the companies concentrate on a single or on some exactly defined market segments. Around 25% of the companies concentrate on niche market and 20% cover the whole market. Almost all enterprises interviewed introduced one or more new products within one year.

4.7.22 Strategic planning, (KfW, 2004)

In the study carried out in 2003-2004 by KfW (2004), over 4,500 German companies were surveyed. About 82% of these companies were SMEs with a turnover of up to € 50 million. The following results regarding strategic planning were received:

- Only 47.3% of all enterprises surveyed, carry out continuous strategic planning with a time horizon of 3 to 5 years. 28.6% of all enterprises do not carry out continuous strategic planning at all.
- Depending upon the size of the SME, only 14.8% to 23.8% of the enterprises make regular environmental analyses.
- Strategic controlling is more widely used in SMEs. Depending upon the size of the SME, 29.0% to 52.8% of the enterprises use strategic controlling functions.

The empirical research confirms the finding of previous studies that the utilisation of strategic planning and strategic tools is related to the size of the company. Smaller companies are less inclined to use strategic planning procedures.

4.7.23 Strategic planning, (Schluechtermann & Pointner, 2004; Hechtfischer, 2004)

Formalised strategic planning is often seen as a function of large corporations, managed by employed executives. LSEs have staff departments and other internal or external resources for long-term planning. On the other hand, SMEs usually do not have these resources and the barriers and reluctance to accept and implement formalised strategic planning and controlling instruments are higher than in LSEs. In SMEs, strategic decisions are often derived from the owner's vision and in the context of the family owner's situation (Schluechtermann & Pointner, 2004). With the aid of appropriate controlling instruments and professional management tools, one out of two SME bankruptcies could have been avoided (Hechtfischer, 2004).

4.7.24 Utilisation of management instruments, (Becker et al., 2004)

Within the ExBa Study 2004 (Excellence Barometer) 1,204 leaders of Germany businesses (mostly SMEs), with a minimum of 10 employees, were surveyed in the context of Basel II (Braun & Schaefer, 2005). It was evaluated to what extent, enterprise leaders said they used management instruments. There is no significant difference of utilisation between highly successful companies and less successful companies. It is assumed that companies implemented management instruments under external pressure e.g. from bank regulations regarding loans. Furthermore, it is recommended to explore in future research programmes the enterprise success factors more systematically (Becker et al., 2004).

4.7.25 Importance of foreign markets, (Ernst & Young, 2005a)

Within the research study in 2005 on 80 successful entrepreneurial German SME companies, competing for the award “Entrepreneur 2005” carried out by Ernst & Young, the importance of foreign markets as seen by the SMEs was surveyed. Around 28% of the SMEs surveyed consider their markets abroad as particularly important for the future, whereas 45% regard their domestic markets as equally important (Ernst & Young, 2005a).

4.7.26 Early warning system, (BDU, 2005)

The BDU (2005), Bundesverband Deutscher Unternehmensberater e.V. (Association of German Management Consultants) carried out a research study in 2004 in Germany on “early warning system in SMEs”. The participation of the machinery and equipment sector in this research study was high. More than 400 companies answered this online survey. The result revealed that SMEs do not give much attention to early warnings. Almost 50% of the responding SMEs have no early warning system at all. As in the case of large companies, SMEs are faced with the same conditions in the market place. SMEs should identify early warning indicators for their enterprise and make use of a formalised system. Companies who use early warning indicators, utilise instruments such as planning and reporting, ABC-analysis, risk listing, benchmarking, brainstorming, pre-rating and balanced scorecards.

4.7.27 Company success factors, (Becker et al., 2005)

In the ExBa Study 2005 (Excellence Barometer), 401 leaders of Germany businesses, (mostly SMEs), with a minimum of 10 employees were surveyed. The assessment of the company success factors for both leaders of successful and less successful companies was evaluated. The research results characterise successful companies in five theses (Becker et al., 2005):

- Leaders in successful companies are better qualified and have a balanced competence profile. They have professional competences in their area of business, but also commercial, management, social and personal skills. Their counterparts in less successful companies usually have single-sided competences in their area of business.
- Successful companies are employee orientated. They carry out employee satisfaction surveys and invest in employee education and training. They participate employees in the decision process, have less resistance to change and a more motivated team.

- Successful companies are efficient in the application of tools and systems. They have functioning quality management systems and constantly improve their business processes.
- Successful companies build efficiently on the success factor internal and external communication. They build upon leaders with excellent social competence and communication style.
- Successful companies build upon the emotional bond to their customers. This requires a high level of customer satisfaction and close interaction between employees and customer representatives.

Success was determined by answers of the respondent regarding the relation of key figure results with an average company.

4.7.28 Strategic objectives, (Becker et al., 2006)

In the ExBa Study 2006 (Excellence Barometer) 347 leaders of Germany businesses (mostly SMEs) with a minimum of 10 employees were surveyed. In addition to the strategic success factors and application of strategies, as in 2005, the use of explicitly formulated strategic objectives was surveyed and discussed. In 74% of the successful companies strategic objectives are explicitly formulated with defined indicators as against 50% in less successful companies. About 29% of the less successful companies do not have explicitly formulated strategic objectives at all (Becker et al., 2006).

The authors of the research study came to the following conclusions:

- The gap between successful and less successful companies is greatest in category company policy and strategy.
- Successful companies use explicitly formulated strategic objectives with indicators for frequent control.
- For their strategy development, successful companies more often use analytical and structured basics for the decision process, such as market analysis, internal and external benchmarks.
- In the growing competitive environment, successful companies build upon a strategy mix such as innovation and market leadership.

Success was determined by answers of the respondent regarding the relation of key figure results in an average company.

4.7.29 Merger and acquisition, (Weissman, 2006)

Like LSEs, SMEs are keen to acquire competitor companies. A study by Weissman (2006) of 500 “Mittelstand” companies with a turnover of €3 million to € 1 billion, revealed that 23% of those companies are currently planning to take over another enterprise. Three quarters of the companies surveyed were interested in acquisition.

4.7.30 Strategic planning, (Held et al., 2007)

From November 2006 until March 2007, the University of Aalen, Germany, conducted a SME survey. In total, 631 small and medium-sized enterprises with less than 500 employees and a turnover of less than € 50 million participated. Of these, 33.8% were production companies. The remainder were from different sectors, such as wholesale, retail and construction, in addition to consultants and marketing agencies. The results of this survey are (Held et al., 2007):

- Around 60% to 70% of the SME leaders have their own strategic life plan.
- German SMEs consider strategic planning as an important success factor.
- Profit, winning customers and cost reduction play an important role in German SMEs. Human resource strategies have a lower priority and questions regarding future trends are generally neglected.
- Only about 40% of the SMEs carry out efficient strategic planning. Obstacles to strategic planning are time constraints, inadequate resources, lack of awareness and competence problems.
- If strategic planning is neglected, it is related to leadership qualification.
- Management tools such as SWOT analysis and benchmarking are well implanted in German SMEs.
- As expected, general managers and owners carry out strategic planning. External strategy experts play a minor role.
- The strategic plan is often not fully adopted. Only 43% of the companies surveyed have regular strategy meetings. Most companies do not yet see strategic planning as a tool for gaining competitive advantage.

Held et al. (2007) argue for better leadership qualification and suggest continuing research in this area.

4.7.31 Potential analysis strategic planning, (Steria Mummert, 2007)

In July 2007, about 170 SME executives were surveyed in a research study carried out by Steria Mummert Consulting and “Wirtschaftswoche” (Business Week), Germany’s most important weekly economic and business magazine. The study revealed the following (Steria Mummert, 2007):

- About 57% of the respondents consider strategic planning for controlling of business activity as important.
- Only 15% of the surveyed SME executives feel that the concept of a company strategy can be neglected. The research results indicate that these companies had a declining total turnover within the last three years.
- About 37% of the SMEs who consider strategic planning important have increased sales over the last three years.

4.7.32 Insolvency and management problems, (Euler-Hermes, 2007)

Euler-Hermes (2007) Kreditversicherungen (Credit Insurance) and the Centre for Insolvency and Turnaround Management of the University of Mannheim, Germany, interviewed 125 insolvency administrators who, to date, had handled about 19,000 insolvencies in Germany. The research study revealed that the following management problems caused insolvency:

- Lack of control (79%)
- Finance problems (76%)
- Lack of control of receivables (64%)
- Autocratic leadership style (57%)
- Poor communication, little transparency in communication (44%)
- Investment flops (43%)
- Poor production planning (41%)

4.7.33 Weaknesses of German managers, (Dembkowski, 2007)

Dembkowski (2007) carried out 20 qualitative interviews with institutional investors and managers of private equity companies. These institutions invest in LSEs and SMEs Europe-wide. They were asked about the experience they had had with the managers of the companies in which they had invested. One conclusion they reached, was that they considered the lack of strategic thinking and action as one of the great weaknesses of

German managers and they criticised the lack of strategic experience. Only a few German managers were able to develop a strategy and turn it into concrete action to be realised with the company's resources. The investors defined two categories of German managers:

1. Former strategy consultants: The number of managers who have really created value is very small. They got the management job, because of a good curriculum vitae, but seldom fulfilled their promise.
2. The administrators: They have excellent operative abilities, but lack vision and cannot create a sound action plan

Section summary; strategic thinking and behaviour of executives in Germany

- (Albach, 1983a): Different strategy types were discovered in German enterprises: the consolidation strategy, the growth strategy and the innovation strategy.
- (Albach, 1983): The management system in German SMEs is less formalised. Most enterprises have no principles of leadership.
- (Geiser, 1983): Obstacles to growth in SMEs were identified. The majority can be ascribed to poor management practices. Larger SMEs have more advanced management practices than smaller SMEs.
- (Albach et al., 1985): SMEs were clustered in:
 - Successful companies with a superior product-market strategy and innovation
 - Consolidating companies with conservative management and little dynamic
 - Companies in growth crisis with inadequate or mistaken investments in markets and innovation
 - Companies in continuing crisis with lack of leadership, organisation, information and communication structures
 - Aggressively expanding companies with a risky multi-strategy
- (Feiland, 1986): Success factors of successful German SMEs were identified:
 - Good planning and control instruments
 - Orientation on niche market
 - High product quality
 - Market orientated innovation and attention to customers
 - Cooperative leadership style and employee orientation
- (Kayser, 1987): There is a lack of management knowledge in SMEs.

- (Schmidt & Freund, 1989): The strategic planning process is neglected in many SMEs. Strategic plans often do not exist. The planning horizon of SMEs is shorter than in LSEs. The size of the SME is an important influencing factor regarding the existence and definition of planning systems. There is evidence of the positive impact of long-term strategic planning on the success of a company.
- (Hamer, 1990): SME leaders have little or no experience nor theoretical knowledge in strategic planning.
- (Simon, 1992): Five common practices of successful German Mittelstand companies (hidden champions) were defined:
 - Combination of strategic focus with geographic diversity
 - Emphasis on factors such as customer focus
 - Blend of technology and good customer relations
 - Rely on the own technical competence
 - Create mutual interdependence between the company and the employees
- (Zechlin, 1995): SMEs in the machinery and equipment sector reacted too late to recession, neglected strategic alliances and over-emphasised niche policy. German machines are over-engineered and too complicated.
- (Uhlig, 1995; Ackermann, 1995; Heise et al., 2005; Sommer, 2005): It is argued that German manufacturers of machinery and equipment should consider production in foreign countries in their internationalisation strategy. On the other hand, there are reports that companies are returning to Germany after disappointing experiences with production in foreign countries.
- (Laier, 1995): SMEs in the machinery and equipment sector use the VDMA platform in Singapore as a bridgehead for sales, service and direct investment in East Asia.
- (Schmidt et al., 1995): It is argued that SMEs in the production sector are concentrating too much on exports. Dominance in exports is seen as a disadvantage for German SMEs. It is proposed to complement the export strategy with a direct investment strategy.
- (Kriegbaum, 1995a): Companies in the machinery and equipment sector have difficulties in managing business cycles with fluctuating demand. The lack of sufficient control instruments and early warning systems lead to a delayed reaction (“reaction lag”) to business cycles.
- (Maass & Clemens, 2002): Corporate citizenship activities are carried out in most of the SMEs.

- (Simon, 1996): Strategies of successful German SME were identified. The most important are:
 - Clear and challenging objectives, trust in their own strengths
 - Concentration on markets and competences; global, customer orientation
 - Good customer relations, value orientated, not price orientated
 - Continuous innovation
 - Competitive advantages in quality and service
 - Intelligent employees, good leadership,
- (Menke et al., 1996): German SMEs neglect strategic planning, market intelligence and environmental screening.
- (Fieten et al., 1997): It is suggested that SMEs should restructure themselves strategically in order to be able to take advantage of future opportunities and to gain freedom of action.
- (Waldmann & Wagner, 2003): SME leaders often do not take the action necessary to execute the strategy and advance the business. There is a serious deficit in Germany's Mittelstand management.
- (BDI, 2003): Family operated SMEs are more inclined to think in long-term perspectives. But, most of the SMEs do not have written strategies and objectives.
- (Ernst & Young, 2003): An important characteristic of a successful SME is a focused strategy.
- (KfW, 2004): Almost 30% of German SMEs do not carry out strategic planning at all.
- (Schluechtermann & Pointner, 2004; Hechtfisher, 2004): There is reluctance to apply strategic planning: strategic decisions are often derived from the owner's vision and in the context of the owner's family situation.
- (Becker et al., 2004): The utilisation of management instruments is investigated. There is no significant difference of utilisation between highly successful companies and less successful companies. Further studies on success factors are suggested.
- (Ernst & Young, 2005a): SMEs surveyed see their future markets abroad or in a combination of overseas and domestic markets.
- (BDU, 2005): Almost 50% of the responding SMEs have no early warning system at all.

- (Becker et al., 2005): Five theses for successful SMEs are defined:
 - Leaders in successful companies are better qualified
 - Successful companies are employee orientated
 - Efficient use of tools and systems (e.g. quality management)
 - Success factor internal and external communication
 - Emotional bond to the customers
- (Becker et al., 2006): The majority of successful companies have explicitly formulated strategic objectives and defined indicators and communicate these to the employees. They build upon a strategy mix such as innovation and market leadership.
- (Weissman, 2006): German SMEs are increasingly interested in the acquisition of competitor companies.
- (Held et al., 2007): Empirical research regarding strategic planning concluded:
 - Leaders consider strategic planning as an important success factor.
 - Human resource strategies have a lower priority and questions regarding future trends are generally neglected.
 - Less than half of the SMEs surveyed carry out efficient strategic planning.
 - If strategic planning is neglected, it is related to leadership qualification.
 - General managers and owners carry out strategic planning.
 - Most companies do not yet see strategic planning as a tool for gaining competitive advantage.
- (Steria Mummert, 2007): About 57% of SME executives surveyed consider strategic planning for control of business activity as important.
- (Euler Hermes, 2007): Reasons for insolvencies are analysed. Most companies failed because of lack of control and lack of control instruments.
- (Dembkowski, 2007): Qualitative research revealed that the lack of strategic thinking and action as well as the lack of strategic experience is one of the great weaknesses of German managers in LSE and SMEs.

4.8 Summary

This chapter has introduced and discussed various empirical and statistical studies and papers regarding SME research in Germany on strategic thinking, strategic behaviour, strategic planning and strategy execution on the functional level as well as the top management level, published since the early 1980s.

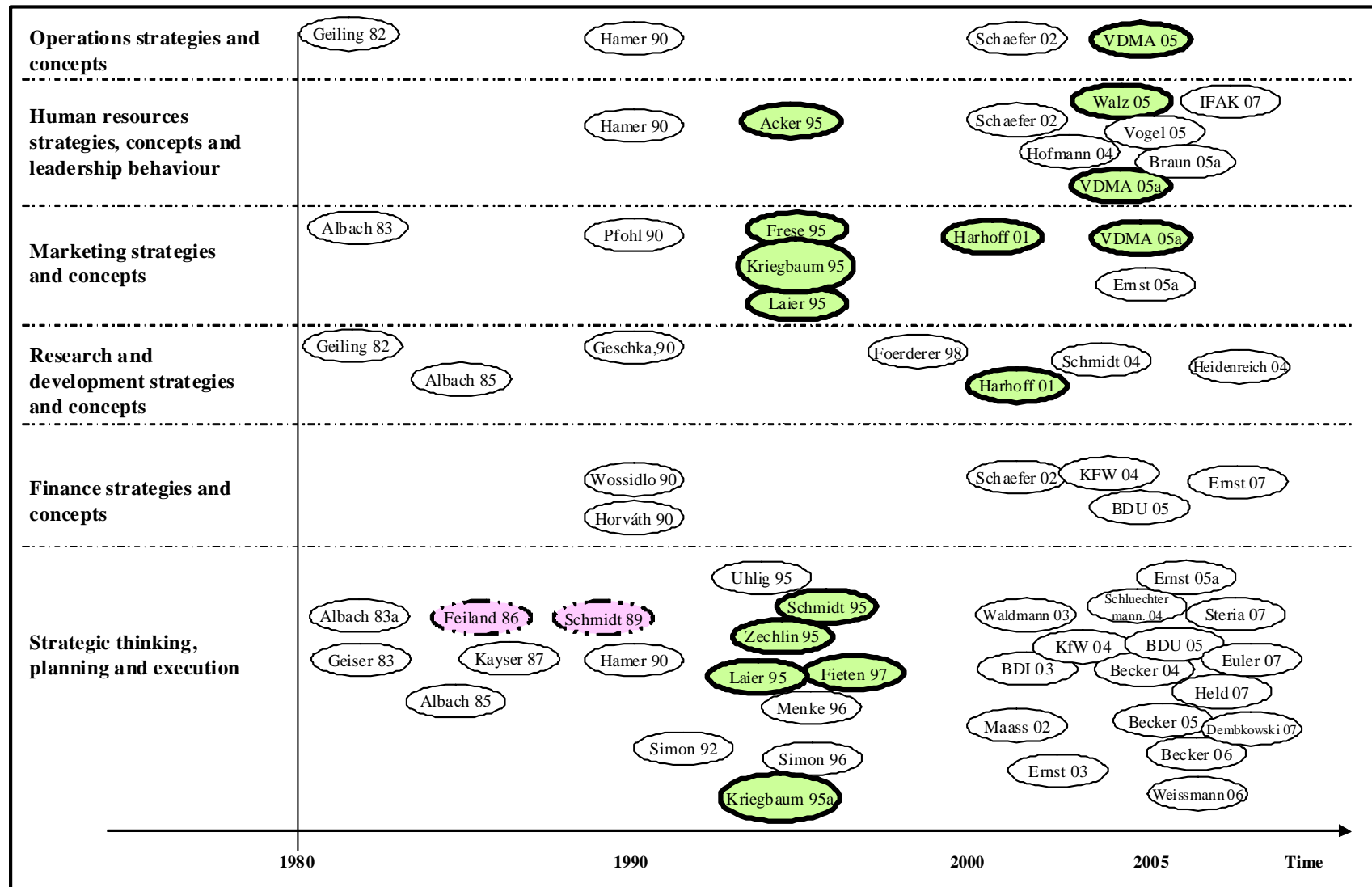
Figure 4.1 depicts the empirical studies and papers on SME strategic management introduced above. The graph suggests that there has been an increase over time in strategy-related research on German SMEs. There has been little research in the machinery and equipment sector regarding strategic planning within the last ten years.

Table 4.1 and 4.2 list the topics and results of the various empirical studies and papers on SME strategic management at the company level and in functional areas. Results relating to management skills and education and leadership are listed in the right column.

Most of the SME research cited above concentrates on how and to what extent strategic thinking, management practices, strategic management and strategic planning are applied. Some research is related to what impact it has on the business (Schmidt & Freund, 1989; Becker et al., 2006). Many SME leaders are not aware of the benefits of strategic planning or neglect it although they know about its benefits (Menke et al., 1996; KfW, 2004, Hechtfisher, 2004; Schluechtermann & Pointner, 2004). One of the great weaknesses of German SME managers is lack of strategic thinking and action as well as lack of management knowledge and strategic experience (Dembkowski, 2007).

The education of business leaders regarding management practices, strategic management and strategic planning is, however, more or less neglected. Kayser (1987), Held et al. (2007) and Dembkowski (2007) touch on the issue of education. Held et al. (2007) researched the relation of management skills and education with the application of strategic management but did not research its impact on the outcome and performance of the enterprise.

Researchers and social scientists propose continuing research in the area of strategic management in SMEs and educating SME leaders in strategic management (Held et al., 2007; Dembkowski, 2007)



Legend: Machinery and equipment sector (Name 83) Manufacturing sector (Name 86) SME general (Name 86)

Figure 4.1: Empirical studies and papers on SME strategic management at a glance

Source: Developed by researcher

Researcher	Results	Strategic management company level	Strategic management / strategies in functional areas					Management skills / education and leadership
			Operations	Human resources	Marketing	Research & development	Finance	
Geiling 1982			Flexibility, speed			Involvement in government policy		
Hamer 1990		Lack of strategic planning	Family aspects influence decision	Reduction of vertical integration				Lack experience strategic planning
Schaefer et al. 2002			Average utilisation of IT systems	Less employee equity participation			Lack of financing instruments	
VDMA 2005a			Reduction of vertical integration					
Acker 1995; Schaefer et al. 2002				Employee development				
Hofmann 2004				Problems in executive succession				
Walz 2005				Employee orientation				
VDMA 2005a; Braun 2005a				Improved HR practices				
Vogel 2005				High payoff by improve HR				
IFAK 2007				Low employee motivation level				Poor leadership practice
Albach 1983					Niche strategy, little marketing			
Pfohl 1990					Lack of marketing awareness			
Frese 1995					Marketing strategy, concepts important			
Harhoff et al. 2001					Lack of marketing intelligence			
VDMA 2005a; Kriegbaum 1995					Value through service			
VDMA 2005					Modest price increases			
VDMA 2005a					Fairs dominate marketing comm.			
Ernst & Young 2005a		Importance of foreign markets			Market dynamic factors			
Albach et al. 1985						Innovation strategies		
Geschka 1990						Lack of innovation methodology		
Foerderer et al. 1998						Customer input for innovation		
Harhoff et al. 2001						Innov. strategy, process vital		
Schmidt & Wossidlo 2004						Little cooperation with universities		
Heidenreich & Wimmers 2007						Lack of strategic innovation mgmt.		
Wossidlo 1990							Neglect of financial planning	
Horváth & Weber 1990							Neglect of financial instruments	
KFW 2004							Low equity ratio	
Ernst & Young 2007							Alternative financing methods	

Table 4.1: Empirical research papers on SME strategic management in functional areas

Source: Developed by researcher

Researcher	Results	Strategic management company level	Strategic management / strategies in functional areas					Management skills / education and leadership
			Operations	Human resources	Marketing	Research & development	Finance	
Albach 1983a		Strategy types						
Albach 1983		Less formalised mgmt. system						No leadership principles
Geiser 1983		Mgmt. practice related to SME size						Poor management practice
Albach et al. 1985		Strategies types in companies						Lack of leadership
Feiland 1986		Success factors for SMEs						Success factor leadership style
Kayser 1987		Problem in general management						Lack of management knowledge
Schmidt & Freund, 1989		Strategic planning related to success						
Simon 1992		Attributes of hidden champions						Global leadership prerequisite for success
Zechlin 1995		Neglect of strategic alliances						
Uhlig 1995; Ackermann 1995; Heise et al. 2005; Sommer 2005		Production offshoring						
Laier 1995		Platform for direct investment						
Schmidt et al. 1995		Direct investment strategy						
Kriegbaum 1995a		Lack of controlling & early warning						
Westebbe & Logan 1995; Maass & Clemens 2002		Corporate citizenship						
Simon 1996		Attributes of successf. companies						Good leadership prerequisite for success
Menke et al. 1996		Neglect of strategic planning						
Fieten et al. 1997		Strategic restructuring						
Waldmann & Wagner 2003		Lack in strategy realisation						Serious deficit in management
BDI 2003		No written strategies						
Ernst & Young 2003		Strategy focus						
KfW 2004		Lack of strategic planning						
Schluochtermann & Pointner 2004; Hechtischer 2004		Reluctance to apply strat. planning						
Becker et al. 2004		Utilization of mgmt. instruments						
BDU 2005		Lack of early warning						Good leadership prerequisite for success
Becker et al. 2005		Attributes of successf. companies						Relation company success & qualification
Becker et al. 2006		Relation strat. mgmt. and success						
Weissmann 2006		Company acquisition						
Held et al. 2007		Relation strat.plan. leader qualificatn.						Manager qualification & education
Steria Mummert 2007		Importance strategic planning						
Euler Hermes 2007		Lack of controlling & instruments						
Dembkowski 2007		Lack of strategic management						Lack of strategic experience

Table 4.2: Empirical research papers on SME strategic management on company level

Source: Developed by researcher

Figure 4.2 summarises the issues and conclusions drawn, the contribution to the research project made with this chapter, the knowledge gaps identified and research questions arising.

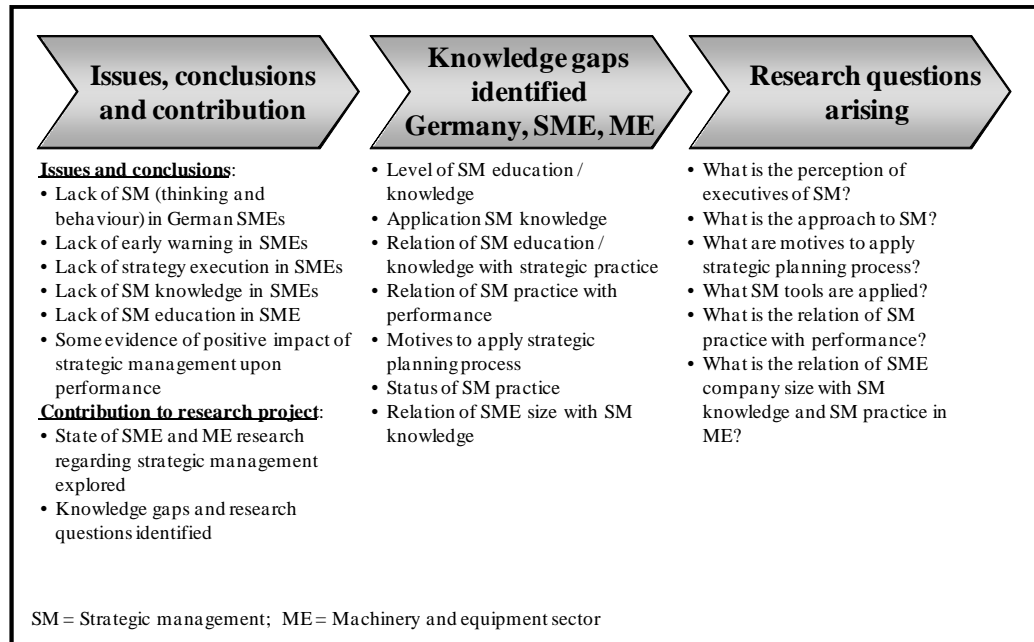


Figure 4.2: Chapter contribution and summary

Source: Developed by researcher

The following chapter describes and discusses the state and practice of management education in Germany. Furthermore, previously published international research results, empirical studies, statistical analyses and publications regarding the impact of management education upon performance are introduced.

5 The state, practice and impact of management education

“Organism will only survive if their rate of learning is equal or greater than the rate of change in their environment.”

Heinrich Flik (Quoted in Handelsblatt, 2005, p. 47)

5.1 Introduction

Chapter 4 has introduced the results of a comprehensive literature review of empirics, papers and statistic regarding strategic management in German SMEs.

Figure 5.0 list the objectives for this chapter.

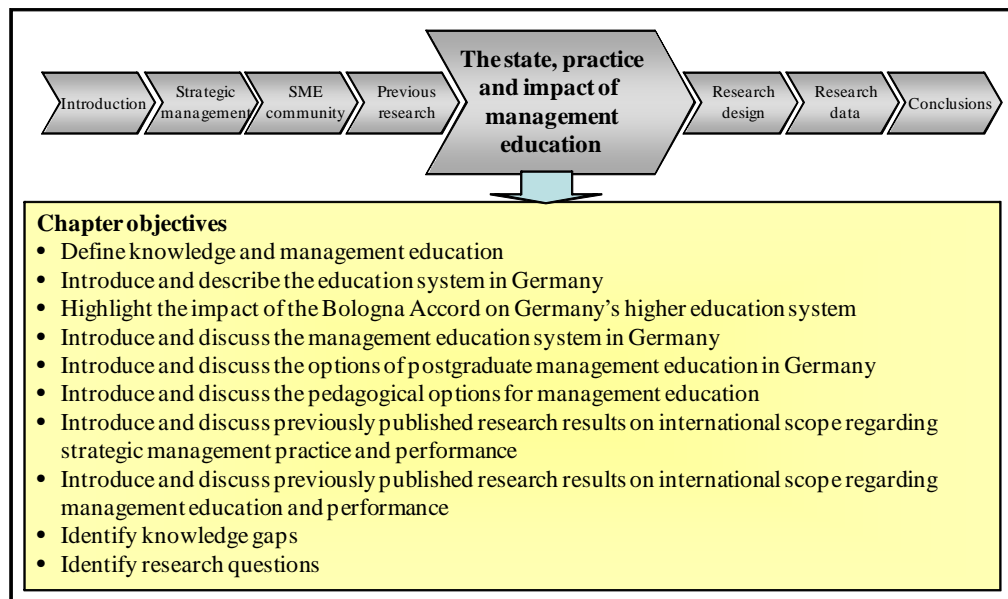


Figure 5.0: Objectives chapter 5

Source: Developed by researcher

Nations, companies and persons compete with one another for wealth, customer orders and lucrative jobs. In that context, education, knowledge and skills are important success factors. Nations know about the competitive advantage of education and invest in it (Adcroft et al, 2004; Wolf, 2002; Emiliani, 2004). In Germany, school education is free of charge and until 2005, German universities had no fees: they now charge about € 500 per semester, regardless of discipline.

This chapter continues the literature review on an international scope on the subjects of management capacity and management education and its impact upon performance. In this context, the education system in Germany, the scope and status of management education in Germany, as well as pedagogical aspects are introduced and discussed.

5.2 What is management knowledge?

In the context of education, management can be considered as a method, technique, concept, or process (Gabler, 2005; Davis & Filley, 1962). Webster (1983, p. 576) defines education, “*originally derived from the Latin educere (to lead out), as the process of training and developing knowledge, skill, mind and character, especially by formal schooling, teaching and training*”. The key word is knowledge.

5.2.1 Knowledge and skills

Plato (360 B.C.) argues that mind and thus knowledge have a different origin and nature. One comes by instruction, the other one by persuasion, one is rational, the other irrational. Webster (1983, p. 1007) defines knowledge as “*a clear perception of something; practical experience; acquaintance with something*”. Social scientists followed with different definitions such as (Davenport & Prusak, 2000, p. 56): “*Knowledge is a fluid mix of framed experience, values, contextual information and expert insight that provides a framework for evaluating and incorporating new experiences and information*”. The Greek word for knowledge is episteme (Επιστημη) (Meyers 2008). From this, the science of epistemology is derived. DeRose (2008, p. 1) defines epistemology as “*..the branch of philosophy that deals with questions concerning the nature, scope and sources of knowledge*” or, in short, “*the theory of knowledge*”.

Nonaka & Takeuchi (1995) introduced the so called knowledge spiral (Figure 5.1) and stress the importance of tacit knowledge and explicit knowledge. The latter is the formal “codified” knowledge, what is known formally and what can be transmitted. Tacit knowledge is what is known implicitly, internally, context-specific and therefore hard to formalise and communicate. Nonaka & Takeuchi (1995, p. 211) define four “*modes of knowledge conversion*” in the context of Japanese business behaviour:

- Socialisation; the implicit sharing of tacit knowledge, often without the use of language
- Externalisation; conversion of tacit to explicit knowledge; often through the use of metaphors and analysis
- Combination; combines and passes explicit knowledge on to other persons
- Internalisation; takes the explicit knowledge back to tacit form as it is internalised (learning by doing)

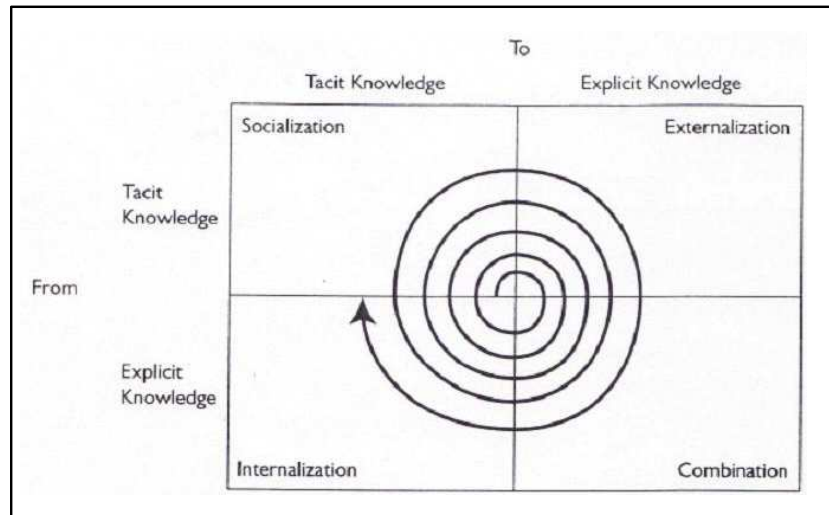


Figure 5.1: The knowledge spiral
Source: Nonaka & Takeuchi (1995)

In the context of management education, knowledge, skills, capabilities, abilities, capacity and competences often used as synonyms. However there is a difference between knowledge and skill. Knowledge in the German language is “Kenntnis, Wissen” which means know how. Skills, capabilities in the German language is “Faehigkeit, Koennen” which means having experience with doing it (Faix et al., 1991). Webster (1983, p. 1771) defines skill as “*great ability or proficiency, expertness*” and capability “*the quality of being capable i.e. having expertise and capacity*” (Webster, 1983, p. 267). Capable is derived from the Latin word “capere” (to take, seize).

The researcher would describe knowledge with “*know how to do*” and skills with “*having experience with doing it*”.

5.2.2 Management knowledge

There is a wide scope of management knowledge on methods, concepts and processes which is available for all functions of an enterprise. There is quality management (International Standards Organization, 2000; Pfeifer & Schmitt, 2007) and six sigma (Morgenstern, 2005; Toepfer, 2004) in the functional area of operations; there are planning tools in human resources; key account management in marketing (Sidow, 1997); innovation management in R&D (Hauschildt, 1993; Bierfelder, 1997); and the budget process in finance. And strategic management puts it all together and aligns it (Wagner, 2007).

Elmuti (2004) argues that managers need the ability to understand and apply management principles and techniques and that they must develop an in-depth knowledge of past and present models, theories and processes.

Jackson (2002, p. 3) defines attributes for the final outcome of management education:

- Ability and willingness to analyse, evaluate and recognise the company's strengths and weaknesses
- Knowledge to identify alternative actions to enhance strengths and address weaknesses
- Capacity to evaluate the probable outcome of these actions
- Capability to select and apply what appear to be best solutions
- Expertise to re-analyse and re-evaluate the outcomes

However, besides knowledge of management tools and concepts "the hard skill", management scientists also argue for "soft skills". Hinterhuber & Krauthammer (1999) suggest entrepreneurial behaviour, Pinchot (1986) argues for intrapreneurial spirit. In this context, researchers also argue for work ethics (Harris, 1984), and ethical change management (Skousen & Bertelsen, 1994), for perception of social clues and business values (Zoffer, 1981) and for dynamic interaction with society's varied and changing needs (Spender, 2005).

The researcher would define management and leadership knowledge and skills in the research context as depicted in Figure 5.2. Management and leadership knowledge and skills consists of theoretical knowledge, practical skills and leadership mindset. Theoretical knowledge means knowing about and how to apply management tools, methods, concepts, or processes. Practical skills mean having experience with the application of management methods, concepts, or processes. Both, theoretical knowledge and practical skills are the so called "hard skills". The third element is leadership mindset, the soft skills, consisting of entrepreneurial spirit (Hinterhuber & Krauthammer, 1999) or intrapreneurial spirit (Pinchot, 1986), emotional intelligence (Goleman, 1998), personality and ethics. Goleman (1998) describes emotional intelligence in five components:

- Self-awareness; ability to understand and accept one's own moods, emotions and drives, as well as their impact on others
- Self-regulation; ability to control or redirect disruptive impulses and moods; thinking before acting
- Motivation; a passion to work for reasons other than money
- Empathy; ability to understand the emotions of other people
- Social skills; ability to manage relationships and build networks; team spirit

Elements of personality or character are attitude, habits, loyalty, integrity, authenticity, temperament, charisma (Zimbardo, 1992; Arnold et al., 2007).

Ethics are "*standards of conduct and moral judgement*" (Webster, 1983, p. 627). Ethical behaviour is based upon a system of values (Arnold et al., 2007). Wieland & Fuerst (2002)

suggest an ethics management system in companies. Ethics and values seem to be in short supply as recent scandals involving German chief executives suggest (Lange et al., 2008; Kaden, 2008). Society is appalled by the behaviour of top managers and managers in general. Social scientists attribute the rise of the far left socialist party “Die Linken“ in the German elections of 2008 to this (Brueck et al., 2008).

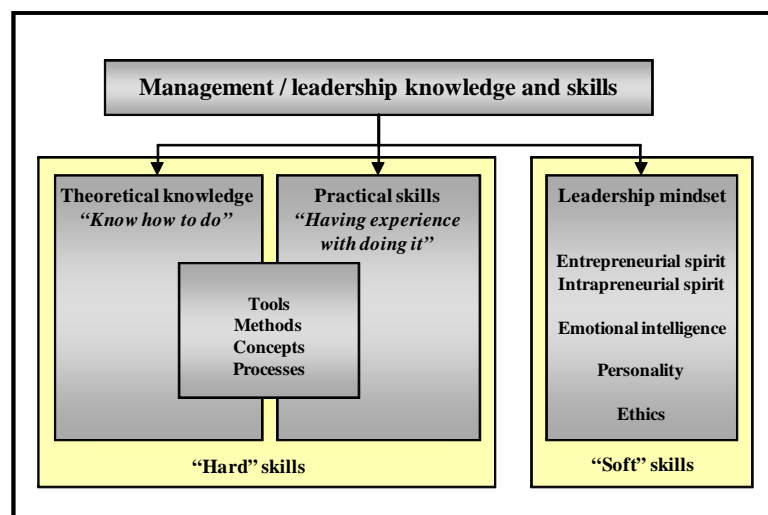


Figure 5.2: Management / leadership knowledge and skills
Source: Developed by researcher

5.2.3 History of management education

Management education has a long history. Richardson (1940) reports the earliest indication was a programme in real estate management taught at Oxford University, in the United Kingdom in the mid 1300s. In Germany, the University of Frankfurt an der Oder appointed the first professor of administration in 1727 (Forrester, 1990). In the USA, management education started in 1881 at the Wharton School of the University of Pennsylvania funded by Joseph Wharton. Graduates from that school, the so called “Wharton men” became business leaders. Other schools, such as the Harvard School of Business and Administration followed in 1904 (Moon 2002). Since then, many universities, academies and other institutions world-wide offer management education in undergraduate, graduate and postgraduate studies. Business schools offer part time and full time management studies for business administration e.g. BBA and MBA programmes. In the Anglo-American hemisphere, management education is generally equated with business schools offering BBA and MBA programmes.

Management knowledge and skills are vital prerequisites for applying strategic management successfully and for leading an enterprise successfully. This thesis is supported by empirical studies discussed in this research project (Kayser, 1987; Held et al., 2007). Management and leadership knowledge is a function of management education provided by many institutions within the education system.

The next section will introduce the education system in Germany and will discuss the implications of harmonisation of the higher education system in Germany.

5.3 The education system in Germany and its harmonisation within Europe

The education system in Germany offers a wide range of options for people to qualify themselves.

5.3.1 The basic structure of the education system in Germany

Figure 5.3 depicts the basic structure of the education system in Germany: basic, since the responsibility for education and cultural affairs lies primarily with the sixteen Federal States (BMBF, 2008). This sovereignty in educational affairs has led to some differences in the education system in Germany since 1949. In order to coordinate the rules, regulations and legislation within Germany, the Ministers of Education meet on a regular basis in the so called “Kultusministerkonferenz” (Standing Conference of the Ministers of Education and Cultural Affairs of the States in the Federal Republic of Germany) (Kultusministerkonferenz, 2008). Note: Sovereignty of educational and cultural affairs of the Federal States is set out in the Basic Law of the Federal Republic of Germany of 23 May 1949 (Bundeszentrale fuer politische Bildung, 1990).

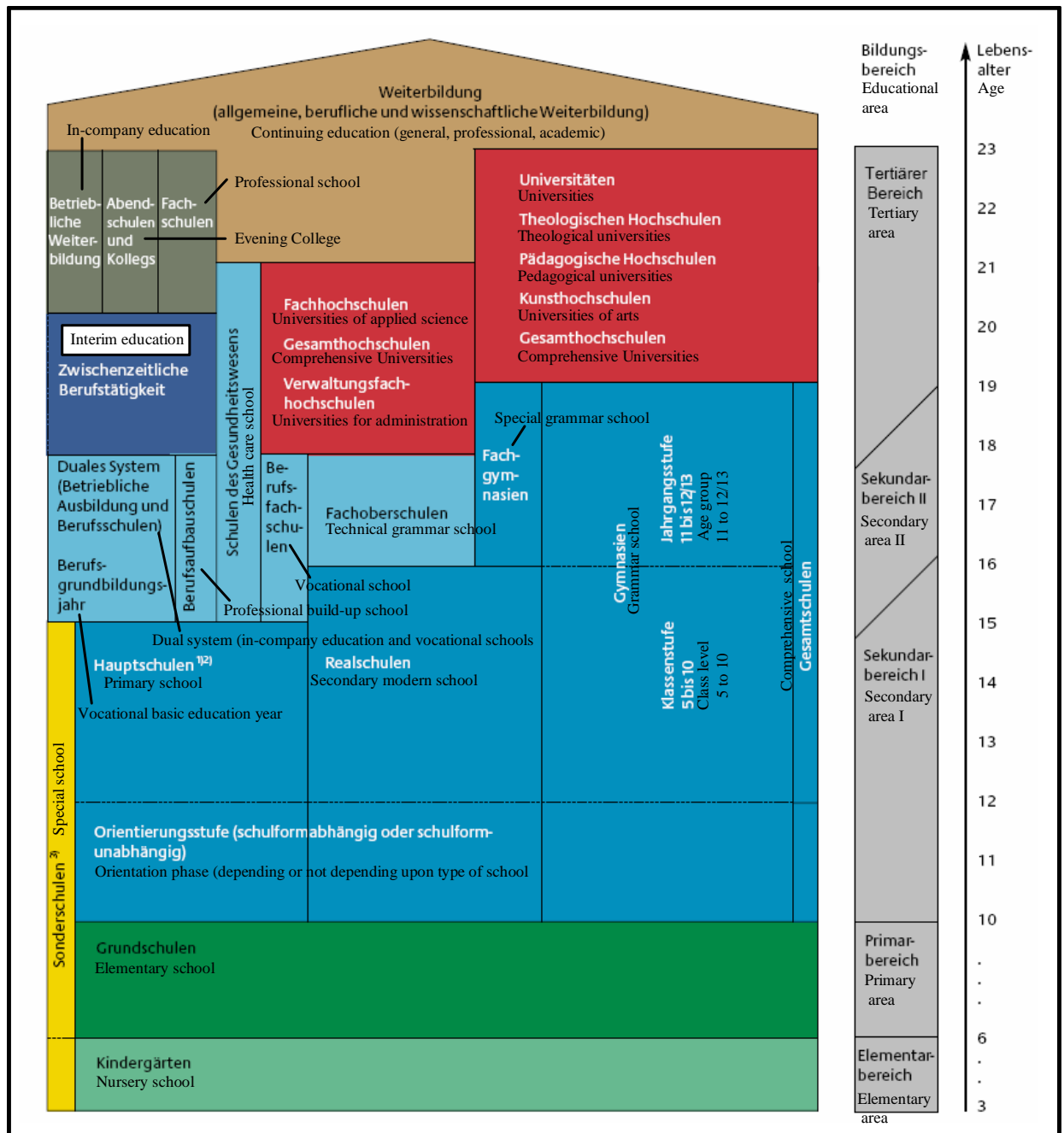


Figure 5.3: Basic structure of the education system of Germany

Source: BMBF (2008)

Education in Germany starts in the kindergarten. Attendance is voluntary. The aim is to develop social and communication skills. Some states offer a preparatory class for primary school. Compulsory school education begins for children aged between five and seven in primary school and ends at eighteen. Primary school prepares children for secondary schooling by teaching subjects such as German, mathematics, physics, chemistry, biology, arts, crafts, music, history and geography. This orientation at primary school enables pupils and their parents to decide what kind of secondary education is to be chosen. The secondary education offers three options: a child may go to a secondary general school or to an intermediate school or to a grammar school. Pupils coming from the general school usually enter a dual system of in-company training and vocational schooling. Pupils who

graduate from the intermediate schools can enter the dual system or continue in special grammar schools, or “Fachoberschule” which focus on social, technical, or commercial subjects. They can attend colleges, universities or universities of applied science (Fachhochschule). Pupils graduating from grammar school can enter the dual system, or attend any college or university. A broad range of institutions offer classes and seminars for continuing training.

5.3.2 The harmonisation of higher education in Europe

Higher education systems within the European Community are quite different and difficult to compare. Although the members of the European Community mutually recognise the qualifications and grades in higher education (BMWF, 2008), they concluded that harmonisation would be best for the future. In May 1998, the Ministers of Education of France, Germany, Italy and United Kingdom signed the Sorbonne Joint Declaration on the harmonisation of the architecture of the European higher education system. Besides harmonisation regarding the two step education of undergraduates and graduates, this declaration states that students and the teaching body will be encouraged to study or teach outside their own country (BMWF, 2008a). In June 1999, all Ministers of Education of the European Community signed the Bologna Accord on higher education in Europe (BMWF, 2008b). The ministers undertook to meet the following objectives by 2010 (BMWF, 2007):

- Introduction of a system with coherent and comparable grades
- Adaptation of the two step education system (undergraduates, graduates)
- Introduction of the credit system according to the ECTS model
- Promotion of mobility of students, teaching body, scientists and administrators
- Promotion of the European cooperation regarding quality assurance
- Promotion of European dimension in higher education

In Germany, the Bologna Accord resulted in drastic changes to the higher education system, which, hitherto, had been split between the more praxis orientated (Fachhochschule, universities of applied science) and the more theoretical orientated (university, technical university).

From 2008, a German university may offer the “old” qualifications such as Dipl.-Ing. in addition to the “new” qualifications such as Bachelor and Master. Both universities and universities of applied science may offer Bachelor and Master degrees (BMBF, 2005a).

As there are still arguments, discussions, confusion and friction (Scherer, 2005; Schmiedekampf, 2008), universities are reluctant to implement the new system and

Germany lags behind the Netherlands and Norway in implementation by 2010 (BMBF, 2005a).

With the Bologna Accord, the European-wide exchange of students and teachers is promoted, which may positively influence the quality of management education. About 60% of the new higher education studies in German universities are involved in international co-operation with universities and research institutions abroad (Schwarz-Hahn & Rehburg, 2003).

The next section goes on to describe where and how management and leadership skills and especially strategic management skills can be acquired in Germany.

5.4 Management education in Germany

The researcher would begin strategic management education in the “Kindergarten” as eventually children and pupils have to manage something, whether it may be a birthday party or themselves or parental expectations of their career. Although society may not yet be ready for a proposal of this kind, the researcher firmly believes that the earlier strategic thinking and behaviour is taught and learned, the better it will be for individuals and society. Policy makers in Germany are beginning to realise the benefits of early management education. In Bavaria, in 2008, the Gymnasium Pfarrkirchen (grammar school) started the “Unternehmer-Gymnasium Bayern“ (UG Bayern, 2009). In this project, management education is provided to pupils starting at the tenth grade (age 15 to 16). Entrepreneurship is fostered and the scholars are encouraged to start a company.

Kaplan & Norton (1996a, p. 77) describe four perspectives in their balanced scorecard. One perspective is learning and growth “*which gives companies the capacity for what we call strategic learning*”. This view is supported by the researcher.

5.4.1 Management education in the areas before the higher education

In Germany, some basic management knowledge such as accounting, economics and marketing can already be acquired during secondary education, stage one and two (Figure 5.3).

An individual who selects the dual system will graduate as Facharbeiter (professional) after three years fulltime apprenticeship and vocational schooling. A mechatronic specialist is one such example: he can continue his education and become a Meister (master) after three more years of part-time education (evenings and weekends), which is offered by the regional IHKs (Industrie und Handelskammer = Chamber of Industry and Commerce) and other institutions. This part-time education includes basic management training such as finance, accounting, marketing, organisation, quality management, HR management and business planning which enables the student to start and operate a small

business. Based on an interview with an individual who had recently finished his Meister education and a review of the curricula of three different IHKs and two other institutions, it appears unlikely that strategic management is part of the curricula (IHK Schwaben, 2008; IHK Pfalz, 2008; IHK Hamburg, 2008; EBZ, 2008; Bundesfachschule Metallhandwerk Rosswein, 2008). The Meister qualification permits the education of future Facharbeiter (professionals) on the job.

Those with a Meister qualification can continue their studies (BMBF, 2006; 2007) and become a Techniker (certified technician) or Technischer Betriebswirt (technical business economist), which takes about three years of part-time study. As in the case of the Meister, the Techniker education also includes courses for basic management such as finance, accounting, marketing, organisation, quality management, HR management and business planning. In addition, general management courses are offered such as business start up, controlling, planning and decision techniques (SGD, 2007; EBZ, 2008a). However, these courses are optional. The Hamburger Akademie (2007) offers in their optional general management course strategic planning and business decision methods.

Meister and Techniker often start and manage small businesses in the machinery and equipment sector.

5.4.2 Management education in the areas of higher education

Higher education started in Germany with the foundation of the first university in Heidelberg in 1386 (Universitaet Heidelberg, 2009). In 2009, Germany has 355 universities (91) and universities of applied science (264) operated by the Federal States, public institutions or private institutions (Uni Liste, 2009; BMBF, 2004a). All universities operate on the basis of the “Hochschulrahmengesetz” (framework act for higher education) of 1976 (BMJ, 2007). In light of the forthcoming harmonisation of higher education within the European Community, this law was amended in 1998 to allow Bachelors and Masters education to degree level (BMBF, 1997, 2004, 2004a).

The BMBF (2004) defines higher education bodies as an important part of society. Universities contribute to the nation by:

- Conducting scientific research
- Educating and transferring knowledge to individuals and institutions
- Being active in science and society
- Providing guidelines for society

Like other universities in the European Community, German universities have a good reputation regarding continuing research, teaching and pedagogy. However, in the case of management education, most German universities have failed to provide strategic

management courses in their curricula. Managers receiving higher education had to find other sources for management education (Ramirez, 2004). Ramirez (2004, p. 441) states that *“German managers appear to develop their managerial skills almost wholly in-house and there is little mobility”*.

In a study among university graduates in Germany, in 2001, the importance of acquired knowledge (Kenntnisse und Faehigkeiten) was surveyed, offering 12 parameters: faculty specific competences; method competence; social competences; self-organisation; presentation skills; theoretical foundations; scientific methods; foreign languages; economics; information technology; legal knowledge; and multi-disciplinary thinking (Briedis & Minks, 2004). Neither management knowledge nor strategic management was considered.

The Bundesagentur fuer Arbeit (Federal Employment Office) publishes an annual booklet, which lists all German universities, their faculties and courses of study and summaries of their curricula (Bundesagentur fuer Arbeit, 2007). The summaries of curricula were used for the assessment regarding the inclusion of strategic management and strategic planning and, in addition, samples of university curricula were reviewed.

The following sub-sections provide information on the management education of business economists, engineers and business engineers in Germany.

5.4.2.1 Management education of business economists in Germany

84 universities and 127 universities of applied science (Fachhochschule) in Germany offer business economist (Betriebswirtschaftslehre) courses (Bundesagentur fuer Arbeit, 2007). Study at a university lasts for nine semesters; it lasts for eight semesters at a university of applied science where two practical (praxis) semesters are included. Students at a university graduate as Diplom-Kaufmann or Dipl.-Kauffrau, students at a university of applied science as Diplom-Kaufmann (FH) or Dipl.-Kauffrau (FH). The curricula consist of general business economics, macro economics, statistics, law, accounting and information technology. In addition, optional courses are offered such as general management (Unternehmensfuehrung), human resources, organisation, production, logistics, marketing, operations research, taxes, auditing, accounting, controlling, banking and international management (BMBF, 2006a; Bundesagentur fuer Arbeit, 2007). The BMBF curricula guideline includes a variety of courses for important management areas, but fails to offer strategic management and strategic planning. The Julius-Maximilian University in Wuerzburg, for instance, one of the top universities for business economists, offers courses in business management and business planning, but no courses in strategic management (JMU Wuerzburg, 2007). Graduates have reported that the promotion of management knowledge was less than expected during their studies (BMBF, 2006a).

5.4.2.2 Management education of engineers in Germany

31 universities and 82 universities of applied science in Germany offer engineering courses (Bundesagentur fuer Arbeit, 2007). In 2006, about 642,200 engineers (1.5% of total workforce) were employed by German companies. About 57.6% of these engineers are engaged in production industry such as the machinery and equipment sector as well as the automotive industry (Koppel, 2007). About 30,000 engineers (0.36% of total population) graduate from German universities each year (Braun, 2005), the demand is still higher than output. About 73,000 vacancies for engineers (11.4% of engineers employed) remained open in 2007 (Spiegel, 2007; Koppel, 2007). Koppel describes the main reasons for the shortage of engineers as an insufficient number of graduates in engineering science, the high number of drop outs and the low number of women engineering students (10.8%). In the discipline of mechanical engineering, the student drop out rate of 32% is fairly high compared to the average of 26% of all faculties of German universities (VDI, 2008).

In 1987, about 38% of general managers and presidents of all German companies were engineers (Frechen, 1988). In the machinery and equipment sector the opportunities for engineers are even better (VDMA, 2007a). In that sector, engineers clearly dominate the management. About 64% of the top executives and 56% at the vice president level are engineers. A good half are mechanical engineers.

Engineering studies can be conducted at the universities or at the universities of applied science (Fachhochschule). A university course lasts nine semesters, a Fachhochschule course takes eight, including two practical (praxis) semesters. Students from university graduate as Diplom-Ingenieur; students from the Fachhochschule as Diplom-Ingenieur (FH). Engineering sciences consist of twenty two different branches, such as agricultural, construction, mining, electro, mechanical, mechatronic and textile engineering (Bundesagentur fuer Arbeit, 2007).

The curricula for engineering studies at both the universities and universities of applied science offer little or no education in general management or strategic management (Bundesagentur fuer Arbeit, 2007; RWTH Aachen, 2003; FH Deggendorf, 2007; FHWS, 2007; TU Clausthal, 2009). The leading German university for mechanical engineering studies, the RWTH Aachen (2003), offers optional courses in operations management and basic economics. The university of applied science, from which the researcher graduated in mechanical engineering, in 1973, still does not offer strategic management courses. As in the early 1970s, only courses in general business economics are offered (FHWS, 2007). It seems, as if universities do not expect an engineer to manage a company as the curricula for engineering studies more or less neglect the necessity for education in general management and strategic management.

From the examination of engineering course curricula and review of literature, it is apparent that, in particular, strategic management is not part of the curricula of engineering

studies in Germany. Thus, the German engineers who strive for top positions, for the time being, have to attend management courses, or continue studies such as BBA or MBA, or educate themselves with literature; or do nothing about education in strategic management and apply a trial and error approach.

5.4.2.3 Management education of business engineers in Germany

29 universities and 97 universities of applied science in Germany offer business engineering (Wirtschaftsingenieur) courses (Bundesagentur fuer Arbeit, 2007). This study is a combination of engineering and business economics. The Wirtschaftsingenieur curricula include, management functions such as operations research, quality management, finance, controlling, marketing, general management, as well as business start up (Bundesagentur fuer Arbeit, 2007).

At the university level, the RWTH Aachen (2005), for example, offers in their business engineering curriculum in the mechanical engineering section, courses in accounting, finance, marketing, but not in strategic management or strategic planning.

The picture at the universities of applied science is similar. The Fachhochschule Wuerzburg-Schweinfurt, for instance, offers in their business engineering curriculum strategic procurement, manufacturing strategy, strategic marketing and strategic objectives, but no course in strategic management or strategic planning (FHWS, 2007a).

The curricula for business engineering studies more or less neglect the necessity for education in strategic management.

5.4.3 Postgraduate management education

Continuing education and lifelong learning is a widely accepted objective and task in society. The German BMBF promotes continuing education, surveys it and reports it (BMBF, 2006b). Companies, however, tend to cut down costs and thus continuing education suffers. Bontrup (2008) complains that only 12% of the German population annually participates in any continuing education. The OECD average is 18%: in Sweden, for instance, it is 40%.

Strack et al. (2007) report a survey in which German human resource managers and other executives rated management talent as a high priority. Management talent also means management education.

Friga et al. (2003) argue that globalisation, technological changes and new workplace requirements may affect business education more than any other branch of academia. Sharma & Roy (1996) suggest the internationalisation of management education

Executives need intercultural knowledge and knowledge of how business functions in other parts of the world.

5.4.3.1 Bachelor of Business Administration

Since the Bologna Accord in 1999 and with the harmonisation of higher education in Europe, 81 universities or other institutions were accredited in Germany for Bachelor programmes (FIBAA, 2008). The Bachelor studies offered are general business economics, international management, general management, business administration or business management, or international business. Study, either part time or full time, usually takes six semesters. The number of programme titles suggests that there is still some confusion in German universities and other institutions regarding management education at the Bachelor level. This is also reflected in the academic grade: the internationally known and accepted “BBA” is, unfortunately, not granted in Germany. German institutions may grant the academic title Bachelor of Arts (BA) or Bachelor of Science (BS) (FIBAA, 2008). The German BS or BA programmes are dominated by the universities of applied science. These programmes offer studies in e.g. business administration, media science, economy (FOM, 2008; OTA, 2008).

5.4.3.2 Master of Business Administration

Since the Bologna Accord, 91 universities or other institutions were accredited in Germany for Master programmes (FIBAA, 2008a). The Master studies, lasting four to six semesters and offered by universities and universities of applied science are management, engineering management, entrepreneurial management, marketing management, international management, business administration, business integration, international strategic management, etc. The number of different programmes is confusing. Students graduate as Master of Business Administration (MBA) (FOM, 2008a) or Master of Science (MS) or Master of Arts (MA) (OTA, 2008a). Studies, clearly geared for education in general and strategic management, are offered full time and part time. The latter is especially for executive MBAs, or those in management positions who want to acquire or improve their knowledge in management and, in particular, strategic management.

As of February 2008, about 150 institutions offer MBA programmes in Germany (Heinemeier, 2008). The number is rising and competition for students is increasing. It is therefore important for students to evaluate the quality of the programmes and other features carefully before signing up for study. Cox (2004) and Heinemeier (2008) argue for international partnerships among educational institutions as an answer to globalisation. Students can therefore go abroad to the partner school and participate in courses. Schwertfeger (2008) argues for a career service and support for students to find management positions in industry. Kieser (2004, p. 96) argues that: “*The recent reforms*

create the impression of a thorough Americanisation of the system of higher management education system in Germany”.

In the USA, and in European countries with MBA programmes, the usefulness of MBA programmes, the pedagogy and their teachers have been debated for many years. James (2008) argues that MBA programmes propagate management fads and have become too theoretical. Mintzberg (2004) argues that most MBA students are young and have little experience in management. Students are taught and trained in the wrong ways and given a false impression that they are trained as managers. He complains that this had inadvertent effects on organisations and society.

Gosling & Mintzberg (2004, 2006) argue for 7 tenets that should be applied for MBA programmes:

1. Management education should be restricted to practicing managers, selected on the basis of performance; this is also suggested by Quillien (1993); Watson (2006) argues for work experience as a prerequisite to MBA studies.
2. Management education and practice should be concurrent and integrated.
3. Management education should leverage work and life experience.
4. The key to learning is thoughtful reflection.
5. Management development should result in organisation development.
6. Management education must be an interactive process.
7. Every aspect of education must facilitate learning; the above influences the architecture, faculty and pedagogy of management education.

The researcher does not wholly agree with tenet one. Firstly, management education should start as early as possible (UG Bayern, 2009). To exclude young professionals from MBA studies could be considered as unfair: one could argue that the prerequisite to practicing management is management education. Executive MBA studies are limited to individuals with management experience (Staehli, 1988). Secondly, selection on the basis of performance is questionable, since a manager may sign up for a MBA programme to improve his management abilities and thus the performance of the organisation. One could argue that less successful executives should sign up for a MBA programme and not the successful leaders. The researcher mostly agrees with tenet 2.

Armstrong (2005) and Mintzberg (2004) suggest that, prior to the MBA, people should have a degree in another basic discipline. The researcher agrees, since a purely management education lacks the background and specialist knowledge of another discipline e.g. engineering. The MBA therefore, like the BBA, should be part of post graduate management education.

5.4.3.3 Executive Master of Business Administration

The Executive Master of Business Administration is a special MBA programme offered by some German universities or by universities of applied science to people in management positions. A prerequisite is a certain number of years spent as a manager. Study is normally part time and takes about two years.

Staehli (1988) defines the executive MBA programme as a part of the management andragogy. It is especially designed for the target group executives. The curricula and didactics are adapted to the personal and professional requirements, experiences and life cycles of adult executives.

5.4.3.4 Management academies

For those who are eager to improve their management knowledge but who do not have the amount of time necessary to participate in BBA or MBA programmes, there are many institutions such as universities, associations and private academies in Germany offering management education. Seminars offered are, for example, company start up, leadership, general management and strategic management. The time required ranges from several days (TA Esslingen, 1995) to several weeks (Boston Business School, 2006).

Many management academies offer in-house management training especially designed for the needs of the companies. SMEs often take advantage of these offers as they educate their managers and simultaneously improve the organisation.

5.4.3.5 Corporate universities

Kellie (2004) states that management education and management development are not synonymous terms and do not necessarily refer to the same kinds of practices. Management development is more associated with organisations and enterprises or in-company training. Management training is limited to the development of their own employees and corporate interests play an important role. Companies use education to augment their own business strategy (Meister, 1998). The in-company management development is carried out in so called corporate universities, a trend being fostered by the growing sophistication of company demands (Prince, 2000).

In Germany, c. 80 corporate universities have been established. About 50% are operated by Germany's largest 100 corporations. In comparison, there are more than 1,600 corporate universities in the United States (Schleede, 2002). The teaching body consists of external consultants, professors from international business schools and in-house executives. In their study, Wimmer et al. (2002) compare German corporate universities with their US counterparts. They report that on the German side, the curricula are more directed to the support of strategic and organisational change as against efficiency and

productivity improvements in the US. In German corporate universities, cooperation with highly regarded business schools on an international level plays an important role.

Bower (2008) argues for in-company management development and that managers from inside the company are more successful in the long run. On the other hand, managers developed in-company may be blind to some in-house problems. Thus, he argues that in-company education should always be from an outside perspective.

Moore (1997) characterises corporate universities as innovators in the management education who adjust to market trends and capitalise on their responsiveness, resources and cost effectiveness. Heuser (2002, p. 1) states that: *“Corporate universities are a bridge between the academic world and the business world. It is more and more important for companies to get a fresh infusion of knowledge to manage the permanent transfer of academic knowledge into the company”*.

5.4.3.6 Virtual corporate universities

Many corporations do not wish to start their own university and, in particular, SMEs do not have the financial resources to operate a corporate university. In order to participate from the benefits of a specially designed management development programme for the requirements of the company, they can participate in a virtual corporate university programme.

In 1997, BAA (British Airports Authority) started a virtual corporate university programme with 51 students at the University of Surrey. The idea was to use the synergy between internal development programmes and the external business school resources and qualification structures. For BAA, it was important that training was focused on real issues and business which supported the company’s mission (Anon, 1998a).

Some business schools directly offer partnerships as a virtual corporate university to companies (GSBA, 2007). On the other hand, companies interested in management education via virtual corporate university can take the initiative and approach business schools for a partnership.

5.4.4 Informal learning

Another way for the acquisition of management knowledge is self-study, autodidactic learning, or so called informal or non-formal learning. Informal learning can be done at any place and at any time and is dependent on the self-discipline and self-motivation of the individual.

For informal learning, books, papers, magazines, audio books, videos, etc. are available. In addition, the internet is a huge source of information on all kinds of topics.

Bjoernavold (2000) provides three criteria for informal learning:

1. Informal learning is learning in the environment outside of formal educational institutions.
2. Informal learning is not sufficiently accepted by public educational institutions.
3. Informal learning develops in connection with other activities.

Day (1998) describes merits of informal learning:

- Informal learning is of variable relevance to the learner, since it is not economically feasible to tailor programmes to individuals.
- Informal learning is need-specific and of high relevance to the individual.
- Informal learning is more incremental; the knowledge gap can be filled faster.
- Knowledge from informal learning tends to be used immediately.
- Informal learning arises often spontaneously.

There are also drawbacks to informal training. There is no or little interaction with other students and mutual learning, the outcome may not be specific or sufficient and there is no qualification.

Dohmen (2001) describes the dimensions of informal training:

- Informal learning as experiential learning.
- Informal learning as implicit (non-intentional) learning.
- Informal learning as everyday life learning.
- Informal learning as self-directed learning (self-directed curriculum).
- Informal learning as competence developing learning.
- Informal learning on the job.

One innovative example of government supported informal learning is the Open Learning Agency (OLA). About 1,600 schools, 5 universities, 21 colleges, community centres, etc. in the Canadian province of British Columbia are connected in a knowledge network and provide information, where every citizen can use for informal learning (OLA, 2008).

Svensson et al. (2004) suggest the combination of formal and informal learning with the use of e-learning.

5.4.5 Lifelong learning

Boyatzis & Kram (1999) report the result of studies which indicate that undergraduates and MBAs do not retain knowledge and skills as assumed. In addition, the knowledge available changes and expands rapidly. Dohmen (1996) argues that without continuous learning, individuals may not survive in a complex and unstable world. This principle applies also to individuals in managing positions. Lifelong learning has also become a key focus of the German Government. Innovations in the education system are supported and individuals are encouraged to take over greater responsibility for their own education, development and employment. Schmidt (2005) argues for lifelong learning in SMEs. They should become learning enterprises that are able to adapt to the changing environment and customer expectations. Kruse (2003) defines the triangle of lifelong learning. In the centre of the triangle is the individual, developing his knowledge and skills. He can build upon educational networks, institution, resources and support structures.

As described above, there is a wide range of opportunities and institutions available for those willing to educate themselves in management in order prepare for a management position or to improve or update management knowledge.

The next section goes on to explore the pedagogical aspect of management education.

5.5 Pedagogy of management education

Webster (1983, p. 1320) defines pedagogy as “*the profession or function of a teacher; teaching or the art and science of teaching; especially instruction in teaching methods*”. The word pedagogy is derived from the Greek language (παιδαγωγέω) and means “art of education” (Meyers, 1990). The word pedagogy also includes the Greek word for child (παῖς). Thus pedagogy was initially meant for children or young people.

Didactics is a part of pedagogy, also derived from the Greek language (διδάσκειν). The meaning is “*the art and science of teaching*” (Webster, 1983, p. 506; Meyers, 1990).

Staehli (1988) defines agogy, which is split up in three scientific branches: the pedagogy for the target group young people, the andragogy for adults and gerontogogy for older people. One sub-branch of the andragogy he defines as the management andragogy, geared for adult executives. The idea is, to adapt or design the didactics to the respective group.

In the following the researcher uses the general phrase pedagogy and characterises it with:

- The scope of knowledge to be transferred.
- The way the knowledge shall been transferred.
- The media through which the knowledge is transferred.

Social scientists have differing definitions of pedagogy as regards management education. Staehli (1988) argues for management education of executives within the management andragogy approach. Ashkanasy (2006) proposes a more mature approach to management education, since adult students bring professional qualifications, experience and a high level of intrinsic motivation to the classroom and therefore, makes no sense to teach them simplistic knowledge.

Giauque & Woolsey (1981) suggest the combination of class work with a variety of field projects. Gosling & Mintzberg (2002, p. 64) recommend going beyond teaching and making the education classroom "a place where managers can reflect thoughtfully on their experience". Thorpe (1990) argues that managers learn best from experience and suggests action learning, but warns that practice should not be promoted at the expense of new knowledge. Rehder et al. (1991, p. 49) are critical of the university based model of management education with its "*reductionistic, static, teacher-orientated focus that exacerbates the theory-practice dichotomy*". Naturally, with plain theory only, young managers will find it hard to lead a department or business. Praxis, by applying the theory through project assignments - best in real companies - is crucial. Students also ask for more praxis orientation as a survey in German universities, in different faculties, indicates (BMBF, 2005b). About 50% of the respondents voted praxis orientation as very important.

Norburn (2002) points out that business schools place too much emphasis on formulation and not enough on implementation. Formulating, for example, a strategic business plan is relatively easy. However, implementing the plan by defining consistent, clear tasks and activities and following them up and through with people in the organisation are a real challenge. Kaplan & Norton (2006) also report the failure of companies to link strategic planning with implementation.

Andersen et al. (2006) argues for systematic thinking in strategic management education and describes the "thinking person's institute" (TPI); see Figure 5.4. System structure determines behaviour: strategic change can take place when structure changes and changes in individual thought foster changes in structure, change and leadership. The paramount objective is to inspire and to mobilise the employees.

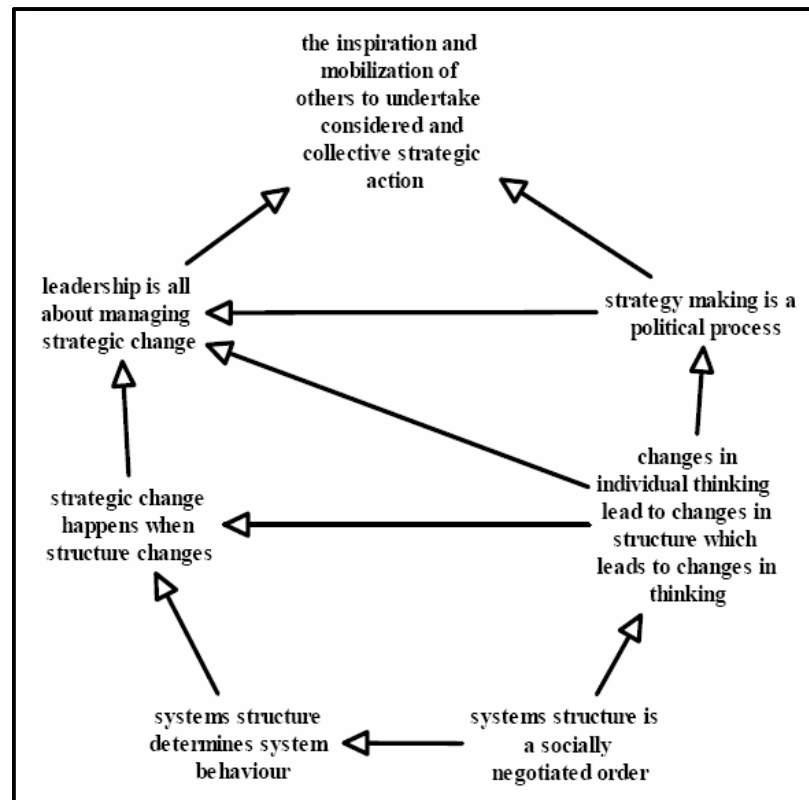


Figure 5.4: Essential assumptions underlying the TPI approach to strategic thinking and acting

Source: Andersen et al. (2006)

There are several recommendations and arguments for innovations in the pedagogy of management education. Ratiu (1977) introduces the cycle of learning modes based upon Plato's four faculties of the soul; intelligence; demonstration; opinion; imagination. Camuffo & Gerli (2004) propose an integrated competency based approach in pedagogy. Schneider & Lieb (2004) argue for implementation of the resource-based view (RBV) of strategic management into the curricula. Bouvier (1982) suggests including anthropology in management education, with a especial focus on ethnography and the theories relating to it. Hampe (2008, p. 2) suggest introducing philosophy in the engineers' management education to encourage reflection on their own position and their own actions in the world. He states: *"Engineers are often faced with ethical conflicts. Philosophy helps to solve these problems"*. Johnson (1991), Sauser (1993) and Cox (2006) argue for consideration of cross-cultural differences, pluralism and diversity in the pedagogy of management education. Warren & Tweedale (2002) complain of the neglect of the historical and ethical dimension in management education. Billsberry & Gilbert (2006) propose using films, fables and fantasy in management learning. Other social scientists suggest promoting a cognitive learning style, emotional intelligence and intuitive awareness in the curricula and teaching methods (Sadler-Smith, 2002; Boyatzis et al., 2002; Sadler-Smith & Shefy, 2007).

However, there is also criticism of the current aim of management education. Management education and practices with *"profit imperative, patriarchy, racial inequality and*

ecological irresponsibility often turn organisations into instruments of domination and exploitation” (Cunliffe et al., 2002, p. 490). Social scientists argue for directing research and pedagogy to develop critical interpretations of management and thereby improve it (Perriton, 2000; Zald, 2002; Reedy, 2003; Learmonth, 2007).

There are contrary opinions on management research in graduate schools and universities. McFarland (1960) asks for a solid research orientation in university management departments. Foy (1979, p. 27) argues for management researchers “*who can flow back and forth across the boundary between firms and academic institution*”. An anonymous source (1995) suggests carrying out management research at graduate level. Coleman (2006) questions the value of research in MBA studies at universities. The researcher would suggest directing the “research” at business schools in a praxis-orientated area, by applying the knowledge acquired in a real company; e.g. a turn-around or restructuring plan; a change management project, etc. Pure academic research is geared for postgraduate PhD studies in management. The researcher agrees with Black (1971) who doubts that a doctoral degree in management is a practitioner’s degree. A PhD in management is more suitable for business school teachers.

5.5.1 Lecturing: the classical teaching method

The word lecture is derived from the Latin words “lectura”, a reading, or “legere”, to read (Webster, 1983). Lecturing is the classical and most used teaching method in universities. Lecturing can be done in different ways: a plain speech without any aid, or with the aid of a blackboard, an electronic whiteboard, an overhead projector with transparencies, or a projector with electronic files such as Microsoft Powerpoint.

Gopnik (2006, p. 1) criticises lecturing as a “*medieval form of learning*”, used when books were rare and describes it as “*a distinctly poor way to pass on knowledge*”. Aigner (2001) argues that lecturing should not be boring, if the teacher employs interactive techniques and uses video clips, charts, graphs, etc. to reinforce the information. The researcher supports Aigner’s view. Lecturing and, in particular, interactive lecturing is and will remain, as one important element of pedagogy. It depends on the teacher, his rhetorical abilities, his preparations for the lecture and lecturing aids, as to whether a lecture is perceived by the students as interesting and valuable.

5.5.2 Workshops for group learning

Workshops are an alternative to lectures. Lipp & Will (1996) characterise a workshop as a meeting where people meet in a class exercise to address a certain topic. Workshops can be used to impart new knowledge, to train participants in new skills, or to solve a certain problem (Materka, 1986). Halper & Deiser (1994) suggest the integrative workshop

method. With this method, different topics, usually considered separately, are connected in an integrative way; e.g. strategy with ethics.

The workshop is led by the moderator, who can be the teacher, or better, one of the students. Posters, charts, flip chart, mind maps, creativity techniques are tools for workshops (Lipp & Will, 1996).

Workshops are an important part of modern pedagogy. The students can learn from one another and probably retain more of what they learned in their long term memory. An old Chinese proverb says (Materka 1986, p.31): *"I hear and I forget; I see and I remember; I do and I understand"*. Boyatzis & Kram (1999) describe acquisition of knowledge and competencies from one other as relation learning, but unlike the lecture, a workshop can only be carried out with a limited number of students.

5.5.3 Distance learning and e-learning

Distance learning was introduced by Sir Isaak Pitman in the early 1840s with the first correspondence course (Hall, 2006). Distance learning courses are especially designed for people doing part time studies and are offered by many educational institutions and universities. There is a growing demand for part-time management, undergraduate and graduate education. Armstrong (2005) reports that the number of part time MBA students has grown by 30.5% to approximately 7,000 and distance learning by 23.2% in UK since 1995.

The student receives materials, works on them, returns them to the educational body and receives feedback (Birchall, 1986). Preparing the materials and providing individual feedback is costly, but working adults appreciated this method of study.

Since the introduction of the internet, distance learning via the "web", e-learning or web-based-learning have become popular. This completely new form of learning requires hardware, software and special knowledge in using computers, programmes and the internet (Goertz & Johanning, 2004).

Modern information technologies now allow learning modes that go beyond e-learning, such as online multimedia lecturing, online chats and instant messaging (Dos Santos & Wright, 2001). It enables collaborative learning, teaching with transcontinental student teams, multiple instructors and the integration of external expertise (Alavi et al., 1997).

Both, classical distance learning and e-learning can be considered as a mode of learning in combination with presence learning in the pedagogy of management education. The advantage is that anywhere in the world students can study material and receive feedback or participate in virtual classrooms. The disadvantage is that face to face interaction, in person with the teacher and other students, is missing.

5.5.4 Action learning

Action learning was first introduced in the 1940s for the education of senior executives in the UK coal mining industry. The purpose was to provide knowledge to enable the executives to steer this industry through the difficult post-war period. At the end of the three year project, it turned out that the annual output at coal mines managed by the educated executive was 30% higher than the average of all mines (O'Hara et al., 1996).

McLaughlin & Thorpe (1993, p. 19) call action learning "*a new paradigm in management education*". They see it as a widely accepted methodology for the development of managers and managerial competence, but see room for improvements. Raelin (1995, p. 1) describes the management education pedagogy in "*two important but dichotomous traditions*", the professional model and the action learning model and argues for more praxis orientation. Mintzberg (1996b, p. 65) states that "*the best managers are very thoughtful people ... who are also highly action orientated*". Therefore, conventional MBA programmes should be "closed down" and "real" managers should be developed. Swenson (2001, p. 579) argues for action learning "*where individuals learn by doing, based on the solution of real problems while working with others who are also engaged in managing real problems*". Reynolds & Russ (2004) propose the combination of critical perspectives to management theory and practice and action based learning in management education. Longenecker (2004, p. 4) argues that "*the transfer of learning of knowledge and practices from the classroom to the workplace can be very limited*" and states that "*to maximise the transfer of learning it is imperative that the manager be an action-orientated learner during the actual educational experience*". The researcher agrees. Management education with lecturing only and without practice tasks or projects in form of action based learning or other means would really limit the abilities of managers. Lecturing and practice tasks should complement each other.

O'Hara et al. (1996) describe the system of action learning (Figure 5.5). The programme starts with an induction and set formation workshop. The participants manage the formation of the set. Set meeting are carried out once per month for the duration of the programme. Personal development, addressed in learning contracts with the set members, reflection and peer assessments are important parts of the system. Workshops are required for each of the modules and the participants are expected to study material relevant to the modules before and after the workshops

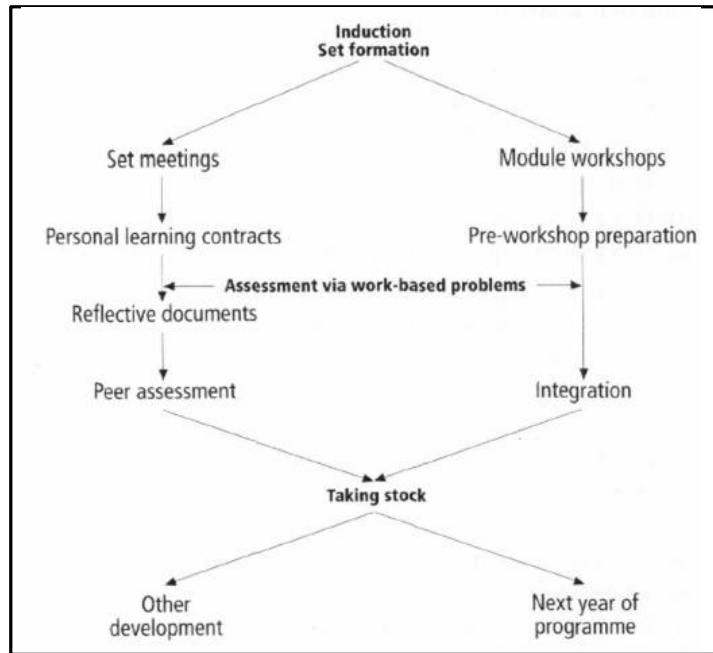


Figure 5.5: Action learning system

Source: O'Hara et al. (2006)

Staehli (1988a) defines the prime objective of action learning as training for taking and accepting responsibility for one's own decisions in reality.

5.5.5 Problem-based learning

Johnson & Werner (1975, p. 276) argue for *"the management problem laboratory as an interdisciplinary programme for the development of managerial problem solving skills"*. With the aid of an extensive data base, students investigate and solve problems in organisations. Sherwood (2004) suggests problem-based learning. Students should be placed in a problem-centred environment. This helps to bridge the gap between theory and practice. Brownwell & Jameson (2004, p. 558) argue that problem-based learning *"capitalises on synergies among cognitive, affective and behavioural learning"*. Students focus on real-world problems. This helps them to *"appreciate multiple perspectives, recognise non-rational elements of decision making and confront ethical quandaries"*. In addition, problem-based learning fosters implementation skills.

5.5.6 Case study method and case problem method

The case study was introduced by the Harvard Business School's, Faculty of Law in 1908 (Copeland, 1954) and later transferred to other disciplines such as business management. Case studies were introduced because of dissatisfaction with conventional lecturing. The case problem method is a variant of the case study concentrating on problem solving.

Staehli (1988a) describes the processing of a case study as follows:

1. Recognition of the problem
 - a. Study of the case
 - b. Acquisition of additional information
 - c. Analysis of the situation
 - d. Defining causal relationships between factors
2. Problem analysis
 - e. Finding the key problems
 - f. Investigate and define the solution problem
3. Alternative solutions
 - g. Defining solutions variants
 - h. Comparison of solution variants
4. Decision finding and justification
 - i. Deciding for one decision and solution
 - j. Justification of the decision and solution

Jain (2005, p. 77, 82) argues that the case method “*is a mission on creativity where many perspectives and backgrounds cross each other to produce a mix of strategic and innovative ideas*”. He considers the case method as a “*superior pedagogy to teach courses and disciplines requiring intense inter-linkages on the context with the existing situation or issue on hand*”. Staehli (1988a, 2001) criticises the case method and argues that a reduction of complexity leads to simplified decision problems, aspects of additional information collection and selection are not considered properly, theoretical knowledge is a prerequisite and the individual case as well as positive decision may be overemphasised. The researcher thinks that the classical case method lacks some praxis orientation since it is a fictive enterprise. However, it is one important pedagogical method among a variety that can be and should be utilised in management education. If it is, apart from lecturing, the only method used in management education it may lead to the following situation (Mitzberg et al., 1998, p. 24): “*The damn guy just sits there waiting for a case study*” – an executive who has a Harvard MBA.

5.5.7 Living case and team approach

Badawy (1976, p. 130, 132) complains that management education is “*too rational and based largely on theoretical neat and unrealistic models of administrative behaviour, rather than dealing with realities of organisational life*”. He suggests a management clinic

a “*business hospital*” where students are confronted with praxis situations and where they can acquire “real functional skills in real situations”. Stewart (1984) and Rao (2005) suggest elements of apprenticeship, or summer placements which include practical experience. The researcher supports these suggestions.

Lamond (1995) suggest consulting projects with client companies in management education. Kalliath & Laiken (2006) and Holtham et al. (2006) suggest the use of teams in management education. With teams solving business cases, team skills are learned. Through the mutual exchange of experiences, deeper and wider knowledge is acquired.

Staehli (1988b, 2006) suggests the genetically growing case study with consulting teams for the executive MBA programme. This type of case study consists of three phases:

1. Phase 1, two months prior to block seminar
 - a. Literature sent to students
 - b. Self-study by student
2. Phase 2, block seminar two weeks
 - c. 50% lecture time
 - d. Team work in four competing consulting groups on a living case (a case study of a real business with the aim to implement the best solution)
 - e. Presentation to the business representatives, teaching body and competing teams; defence of the proposed solution
 - f. Rating of the proposed solutions
3. Phase 3, aftermath
 - g. Experts evaluate the proposal of the consulting teams
 - h. Implementation of the best solution
 - i. Feedback to the consulting teams

Staehli (1988b, 2006) argues that the genetically growing case study with the living case is a holistic, realistic and praxis orientated approach to management education and a pedagogical tool that better fits the needs for the education of business executives.

5.5.8 Business simulation

With the start of the computer era, business simulations are used as a new pedagogical tool in management education. Large corporations such as Boeing and General Electric have used computer simulations in education since the 1970s (Whitney, 2006). Since then, the

complexity of business simulations has increased considerably and educational bodies use business simulations for management education.

There are several business simulation systems available, developed by universities or other institutions, like “Manager 90” (Bielecki, 1993) and “MERKIS” (Strauss, 2006). A business simulation system was also developed on the SAP R/3 ERP platform (Draijer & Schenk, 2004). In Germany, the MARGA computer-based business simulation system is used for management education by universities, academies and companies. Contests are carried out annually (ESMT, 2008).

Whitney (2006) recommends that students should learn in a risk-free environment so that they can make decisions and see the outcome and consequences. Students can run a company in a competitive environment against other teams. They must decide, take risks, define strategies and anticipate competitor strategies and tactics (Doyle & Brown, 2000; Fripp, 1997). Wolfe & Luethge (2003) discovered that a business game performance is not the result of luck and random guesses but more the result of an intelligent decision-making process. Schumann et al. (2006) argue for the incorporation of effective ethical dilemmas in computer-based business simulation systems. Romme (2003, p. 51) calls computer-based business simulations “*microworlds*”. His research suggests that the learning process can be deepened and accelerated by the effective balance of different pedagogical methods including the use of microworlds. Staehli (1988a) criticises computer-based business simulations for over-emphasising quantitative methods and neglecting qualitative aspects of the decision making process. Making decisions is carried out in closed IT systems that do not reflect reality.

As described above on an international scope, there are numerous pedagogical approaches to management education, some of which have been controversially discussed and criticised. One could argue that educational institutions should not concentrate on one method, but should balance the tools and methods available and combine it with praxis orientation. This research will also reveal evidence on whether German executives in the research sector were satisfied with the content and pedagogy of their management education.

The next section will introduce and discuss previously published research results regarding the impact of strategic management practice and management education upon performance outcome.

5.6 Strategic management practice, management education and performance

The key issues of this research are the relation of management education with strategic practice and performance in Germany’s SMEs in the machinery and equipment sector. The following sections introduce and discuss previously published empirical results and research papers in an international context.

5.6.1 What is performance?

Webster (1983, p. 1332) defines performance as “*the act of execution, accomplishment, of meeting the requirements, or fulfilling a promise or command*”. Performance can be determined with parameters, or so called key performance indicators (Weber, 1999). Management scientists and consultants have developed and propose the use of a large variety of key performance indicators (Kuelpmann, 2006; Weber, 1999). Financial performance indicators often dominate the control in enterprises. A well known system of financial performance is the so called Du Pont pyramid of financial ratios (Neely et al., 2000). The balanced scorecard is an accepted tool for planning, measuring, reviewing and controlling performance in different areas of a company and it is recommended for SMEs (Kaplan & Norton, 1996, 1996a; Davig et al., 2004; Ittner & Larcker, 2004). Bititci et al. (1997) suggest an integrated performance measurement system, which would consider the environment, strategies, structure, processes and their relationship. The performance measurement system is embedded in the performance management process, which considers soft and hard factors of the enterprise (Figure 5.6).

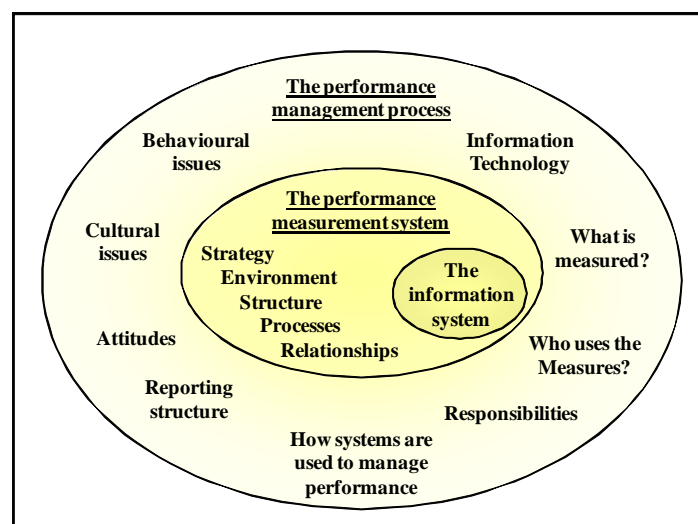


Figure 5.6: The performance management process and system

Source: Bititci et al. (1997)

5.6.2 Strategic management and absorptive capacity

As argued and suggested by social science and management researchers, enterprises and, in particular, SMEs need to develop strategic management skills (Held et al., 2007; Dembkowski, 2007). Enterprises consist of financial resources, research and development resources (patents, hardware, software), production resources (buildings, equipment, material) and, most important of all, human resources. Only the last form the organisation, acquire knowledge and turn it into products and services.

Cohen & Levinthal (1990, p. 128) argue that the “*ability of a firm to recognise the value of new, external information, assimilate it and apply it to commercial end, is critical to its innovative capabilities*”. They call this ability a company’s absorptive capacity. The absorptive capacity of an organisation tends to develop cumulatively and depends upon the absorptive capacity of its individuals, prior investment in their development, existing knowledge and other parameters such as communication with the external environment.

The absorptive capacity construct, introduced by Cohen & Levinthal in 1989, is used in research focused on organisational learning, knowledge management, technology management, international business and strategic management (Easterby-Smith et al., 2005). It was developed at the time of the resource-based view (RBV) and the knowledge-based view of a company and strategic management (Lane et al., 2002).

Lane & Lubatkin (1998, p. 461) argue that firms increasingly rely on the knowledge of other companies to foster the development of their own capabilities. They suggest a learning dyad of the teacher and student firm and define “*relative absorptive capacity*”. Zahra & George (2002) introduce the model of absorptive capacity (Figure 5.7). Antecedents of absorptive capacity are external sources and knowledge complementarity. Lofstrom (2000, p. 6) uses the term knowledge complementarity: “*To refer to the extent the knowledge of individuals is related to and at the same time is different from the knowledge of contacts in their information/advice networks*”. External resources can be partner companies, suppliers, customers, competitors, etc. Experience is gained through the exposure of or the impact of knowledge. Activation triggers are events that trigger the organisation, such as success or failure. Zahra & George (2002, p. 190) call the acquisition and assimilation of knowledge “*potential absorptive capacity*” (PACAP) and the transformation and exploitation “*realised absorptive capacity*” (RACAP) and sustainable absorptive capacity. Social integration mechanisms contribute to the assimilation of knowledge, either formally (e.g. coordinator) or informally (e.g. social networks). Regimes of appropriability (e.g. investments, patents) moderate the relationship between RACAP and competitive advantage.

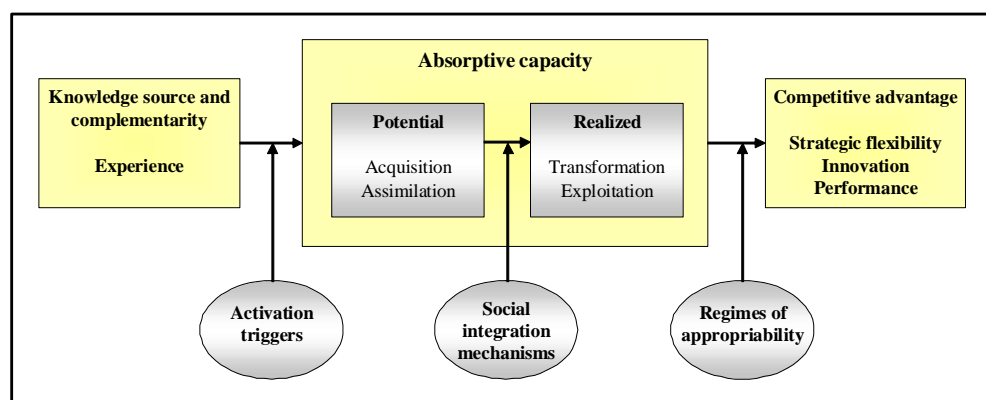


Figure 5.7: The model of absorptive capacity
Source: Zahra & George (2002)

Liao et al. (2003) concluded from their SME research that the dimensions of absorptive capacity, external knowledge acquisition and internal knowledge dissemination is positively related to the organisational responsiveness to the external environment. Gray (2005) suggests that the lack of absorptive capacity in UK SMEs – having prior knowledge and the ability to acquire and assimilate new knowledge, as well as the effective sharing within the organisation – may explain their high failure rate. A research study carried out by Jansen et al. (2005, p. 1010) revealed that units operating in dynamic markets can improve their performance by their potential absorptive capacity. They suggest that *“managing the levels of potential and realised absorptive capacity in a timely fashion is the logic for competitive advantage”*.

Muscio (2007) concludes, from SME research, that investment in absorptive capacity in the form of training and skill improvement is a key factor for innovation. The key word is training.

One could argue: as training, knowledge and increased absorptive capacity in the area of R&D is a key factor for innovation, so management education and increased absorptive capacity in strategic management is a key factor for the overall performance of an enterprise.

5.6.3 Barriers to strategic management

A few empirical papers were discovered regarding research on barriers to strategic management and, in particular, strategic planning in German SMEs (chapter 4). Major barriers identified are lack of awareness, lack of understanding, lack of experience, lack of knowledge about strategic management and planning inadequate personnel resources (Held et al., 2007).

The researcher continued the literature review on an international scale. O'Regan & Ghobadian (2002) state that strategic planning and implementation in SMEs are often associated with lack of capability to overcome potential barriers to strategic planning. Their study revealed, beside, other barriers, a lack of understanding of the overall goals of strategies and a shortfall of employee capabilities. O'Regan & Ghobadian (2002a) identified numerous barriers to strategic planning such as lack of understanding of overall goals and strategies, unanticipated problems and employees' capabilities. They discovered that similar barriers exist in high and low performing firms. High performing companies, however, tend to focus on strategic planning process implementation, whereas low performing companies deal with a higher degree of uncertainty and a lower degree of confidence. They state that *“it is unclear from the limited research carried out to date what actions, if any, firms can take to minimise or eliminate these barriers”* O'Regan & Ghobadian (2002a, p. 416). Wang et al. (2007) explains the lack of strategic planning by listing major obstacles such as lack of experience and inadequate knowledge.

The international research results on barriers to strategic management are similar to those in Germany. One could argue that the barriers to strategic management described above can be directly related to a lack of management education. Motives to apply strategic management were not part of the research effort and results.

5.6.4 The impact of strategic management practice upon performance

A few empirical studies on German SMEs, discussed in chapter 4, suggest the positive influence of strategic management practice on the performance of an enterprise (Schmidt & Freund, 1989; Becker et al., 2006).

The literature review was continued on an international scale and the empirical studies and papers then discovered, generally confirm the positive impact of strategic management practice upon performance (Matthews, 1990; McManus et al., 1995; Schwenk & Shrader, 1993; Dooris, 2002; Baker, 2003; Aragón-Sánchez & Sánchez-Marín, 2005; Karami, 2005; Gibbons & O'Connor, 2005; O'Regan & Ghobadian, 2005; Meers & Robertson, 2007). Griggs (2002) analysed 80 empirical studies and discovered that 61% of the studies identified a favourable link between strategic planning and performance and another 8% providing qualified support.

Research findings indicate that generic organisational capabilities are important factors in the operating environment of SMEs and are associated with and are critical drivers for strategies, strategic planning and performance (O'Regan & Ghobadian 2004). Organisational capabilities such as competing on price, ability to make rapid design changes, quality and on time deliveries, in context with the resource-based view of strategic management, relate to the use of resources to achieve a company's strategic objectives (O'Regan & Ghobadian 2004).

De Vries & Margaret (2003) argue that SMEs need strategic specialists and should develop general management capabilities. Kirby, (1990) states that many SMEs are not aware of their training needs regarding management competence. Breene et al. (2008) suggest the installation of a senior executive as a chief strategy officer in the company. His main task would be the coordination of strategic planning and strategy execution.

Strategic management, and its core process strategic planning, are often neglected in SMEs or are regarded as a preserve of LSEs (Schmidt & Freund, 1989; Hamer, 1990; Menke et al., 1997; Held et al., 2007). However, as research suggests (Kargar, 1996), strategic management is of equal importance to SMEs. Both, LSEs and SMEs, can benefit from strategic management and strategic planning.

Other empirical findings (Stonehouse & Pemberton, 2002) suggest that managers are unconvinced by or are unaware of the benefits of strategic planning. They argue that SMEs concentrate on business planning rather than on strategic thinking and strategic management. Later they state that UK SMEs tend to concentrate on short term planning

and blame this for the poor performance of UK SMEs in comparison with German SMEs. One could argue that German SMEs neglect strategic management and strategic planning even more than SMEs in UK (Dembkowski, 2007; Schluechtermann & Pointner, 2004; Hechtfischer, 2004). Whether the allegedly better performance of German SMEs stems from a longer planning horizon, or from other reasons, could be worth studying in another research project.

McKiernan & Morris (1994) argue that strategic planning alone does not provide success. It can be agreed that strategic management cannot cure every problem in an enterprise and is no guarantee of success. There are many other factors, or risks, that influence performance and success. There can be fraud, accident or an executive who is intent upon his own financial gain rather than that of the enterprise, which deprives it of its success and ruins it (Kendall, 1998; Keitsch, 2000).

There is a much wider range of research results regarding the impact of strategic management practice upon company performance on an international scale. The findings, however, are similar to those in Germany and suggest that strategic management practice has a positive impact on company performance. Research was carried out on strategic management and strategic planning in general, but not on a specific selection of management tools reflecting the strategic management phases.

5.6.5 The impact of management education upon performance

One of the key research issues of this research project is the relation of management education upon the performance outcome of SMEs in the machinery and equipment sector. In the following sections, previously published empirical studies, research results and papers providing direct or indirect evidence that performance and success of societies or companies are fostered by management education, are surveyed. In this context, material from literature research using specific keywords (i.e. engineering management education; strategic management; strategic planning; performance; Germany; SMEs; machinery and equipment sector) was limited. Research results on the relation of management education with performance of German SMEs could not be found. One likely reason for this is that management education so far has not played an important role in Germany's universities (Ramirez, 2004; Dembkowski, 2007) and research in this context was neglected.

Burgoyne et al. (2004) carried out a comprehensive literature search on the development of management and leadership capability and its contribution to performance. Several citations were taken from this research report in the following sections. Burgoyne et al. introduce the value chain of management and leadership development (Figure 5.8).

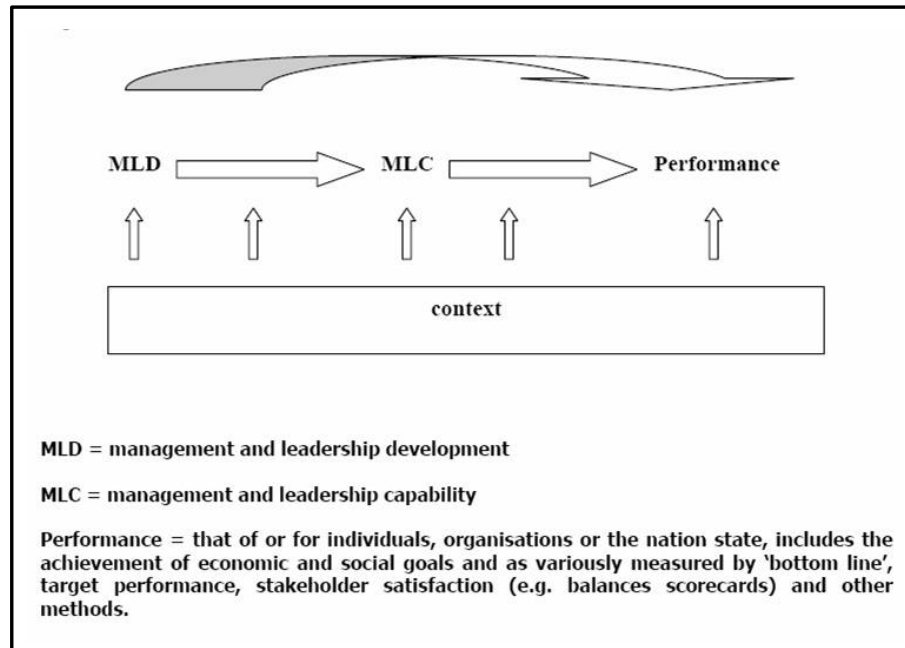


Figure 5.8: Value chain of management and leadership development

Source: Burgoyne et al. (2004)

Burgoyne et al. (2004, p. 1) “summarise the summaries” of the empirical studies (tenet 1 - 5) and propose further research (tenet 6 – 9) as follows:

1. *“Management and leadership development can and does, in the UK and elsewhere, enhance performance for economic and social benefit.*
2. *It does not currently do so to its full potential and there are therefore further performance gains to be had from improving it.*
3. *This improvement can come as much or more from improving the precision with which the management and leadership development investment is made (by individuals organisations and the state), than by increasing the scale of the investment – though the latter might usefully grow as confidence in performance benefit becomes more secure.*
4. *This is because management and leadership development contributes to performance in multiple rather than a single way and what is effective varies very much with situation and context. Fitting the right approach to the specific context is the key.*
5. *Management and leadership capability are located collectively in organisations, sectors and regions and initiatives to develop these, in addition to ones based on education, training and development to create individual capability are needed. Not all capability that exists at the individual level is fully used in collective organisational processes, for a mixture of motivational, organisational and reward reasons.*

6. *A major priority for future research therefore needs to be orientated to improving understanding of what forms of management and leadership development work in what situations.*
7. *To do this future research in this area needs to be more coordinated, more about effect and impact as well as describing the status quo, more longitudinal (to allow for the identification of effects over time) and involve more evaluation to improve and learn the lessons from, ongoing practice.*
8. *Research needs to be more comparative across situations, organisations and nation/state cultures to address the challenge of understanding what works, in what way and how in different situations. For example, at the level of organisations, effective leadership approaches and ways of developing these.*
9. *More research is needed to understand how management and leadership capability contributes to performance and how the different channels through which this operates are activated in different contexts. This will help to target management and leadership development effort”.*

Burgoyne et al. (2004) mention that the precision of the investment in management development should be improved rather than the scale of investment (tenet 3). One question arising from this context is: which improvements would those in management positions recommend?

In tenet 4 Burgoyne et al. (2004) state that not all available management capabilities are used within the organisation. This raises the questions: Why do managers not apply management knowledge and what is the motivation for applying management knowledge?

In tenets 5 to 9 Burgoyne et al. (2004) provide guidelines for further research in the area of management development and its impact upon performance. This research project may provide knowledge contributions by:

- Investigating the impact of strategic management education upon performance (tenet 6; form of management development)
- Research contribution regarding German SMEs in the machinery and equipment sector (tenet 8;across organisations and nations....); research regarding the impact of management education on company performance in German SMEs has been neglected
- Research regarding relation of the type of education with management knowledge and application as well as impact on performance (tenet 8;across situations....)

5.6.5.1 The impact of management education on national performance

One could argue that if management education and development benefits companies it also benefits society since successful companies pay more tax and hire additional employees.

Tony Blair, UK Prime Minister from 1997 – 2007, stated in 1996: “Ask me my three main priorities for government and I will tell you; education, education and education” (Adcroft et al, 2004, p. 522). Politicians and social scientists are convinced that the level of education and investments in the education of people are directly related to national economic development and national wealth (Wolf, 2002).

Emiliani (2004) suggests three improvements in management education to achieve greater benefits for society.

1. Incorporation of guiding principles of the fundamental nature of business for students and staff
2. Concept of avoiding waste
3. Root cause analysis

Porter & Ketels (2003) reviewed the evidence for the causes of UK’s relatively poor productivity in comparison with other countries. They argue that management quality is not the most important determinant of economic performance. They conclude that management education at lower management levels should be considered.

5.6.5.2 The impact of management education on organisational performance

Exploring the relation of management education upon performance outcome in Germany’s machinery and equipment sector is one of the key elements of this research project. In the following sections, previously published international empirical studies, research results and papers are introduced to describe the state of research.

Murphy (1989, p. 47) reports that remarkable quality improvements are traced to management education and states: “*Management education doesn’t just support the strategy, it is the strategy*”.

Fox & McLeay (1991) studied 49 UK enterprises on the topics of recruitment and selection, management development, performance appraisals, rewards and recognition and career planning. They concluded that there is a clear and positive relationship between financial performance and corporate strategy as well as between financial performance and human resource practices.

Fulmer & Graham (1993, p. 35) state that companies “*tend to be significantly more profitable*” if each manager receives 40 hours of educational enhancement per year. Research methodology and sample size are not reported.

Cockerill (1993) carried out research on 150 managers in five organisations. They linked management capability with organisational performance. He defined seven competencies: information search; conceptual complexity; team facilitation; impact; charisma, proactive orientation; achievement orientation. The conclusion was that the selected competencies were positively related to organisation performance with the exception of achievement orientation.

Lee et al. (1993) report that savings of £270 million at British Telecom were made through management training; a sum estimated by managers to have been lost through errors by junior managers. Performance improvement was measured after each training course.

Winterton & Winterton (1996) carried out an in-depth analysis of 16 UK organisations regarding the impact of competence-based management on performance. A significant relationship was discovered between competency based human resource development and business performance.

Barling et al. (1996) studied the effects of leadership training in a large Canadian bank with 20 branch offices, each unit with its own managers. The study suggests that training managers in transformational leadership may well exert significant effects.

DTZ (1998) studied 127 companies that used TEC (Training and Enterprise Council) related management development activity. 63% of the firms identified a positive impact of this management development on performance. Performance improvements were improved responses, higher morale, better product quality, greater customer loyalty or new business.

Mabey & Thomson (2000) studied UK management training with input from human resource development managers and MBAs. They concluded that personnel satisfaction could be largely traced to company policy regarding establishing and running of management training and development.

Thompson (2000) carried out research in about 600 aerospace companies and discovered that high performing enterprises spend more on management development than low performing companies.

Horne & Stedman Jones (2001) studied the state of leadership in UK organisations. He concluded that leadership development was strongly related to organisational performance.

Longenecker & Ariss (2002) discussed how organisations can use management education to create competitive advantage and conclude that management education and development is essential for the competitive advantage of an enterprise. The quantitative research with questionnaire was carried out with 203 US managers and consumers of formal executive education programmes

The UK Council for Excellence in Management and Leadership (CEML, 2002, p. 42) argues that “*there is no real evidence that education leading specifically to qualifications*

in business and management has a causal link with superior performance of the individual or the organisation”. This should encourage research in this area.

Mabey & Ramirez (2003) analysed management development in six European countries. Human resource managers and line managers in 600 companies were interviewed. The results indicate that 25% of the variance in organisational performance can be explained by the strategic approach to human resource management; a long-term proactive strategic approach to human resource development; and the belief that employers take management development seriously.

Good practice in human resource management, including the development of managers, was also the subject of empirical research.

Linkow (1985) argues that human resource development is a key to long-term success of an enterprise.

Gomez-Meija (1988) carried out a longitudinal study on 288 manufacturing companies in the USA. He discovered that significant success in exporting was traceable to the human resource practice of the enterprises such as selection, deployment, compensation and motivation.

Between 1972 – 1992, Pfeffer (1994) studied five US companies with a high commitment to work practices. Together with secondary data, he concludes that good human resource practices were enduring sources of competitive advantage.

Based on a sample of almost 1,000 US companies, Huselid (1995) found that high performance work practices have a significantly economic and statistical impact on turnover and short- and long-term measures of financial performance.

Delaney & Huselid (1996) found in 590 US profit and non-profit firms positive associations between human resource practices (e.g. staffing, training,) and organisational performance. A similar study was carried out by Patterson et al. (1997) in more than 100 manufacturing companies in the UK with similar results.

Pfeffer (1998) reports that high expenditure on training, which is one of his seven performance management practices, has a positive impact on financial performance.

Thompson (2000) carried out a longitudinal study in over 600 UK companies in the aerospace industry. He concluded that high performance work practices increase productivity.

Purcell et al. (2003) conducted an in-depth case study on human resource management with emphasis on competences, training and learning. Strong relations were discovered between employee attitude, job design human resource practices and performance.

Lee & Sokoco (2007) researched on entrepreneurship and knowledge management on 152 Taiwanese companies. They discovered that entrepreneurial orientation has a positive

impact on the capabilities of organisations and knowledge management has a significant impact on innovation and organisational effectiveness.

The results of these empirical studies and papers confirm the positive relation of management education, or human resource development, upon performance outcome. However, it was not found that specific strategic management education, its knowledge and application in practice and their relation with performance were the key issues of previous research.

5.6.5.3 The impact of management education on individual performance

Numerous researchers explored the impact of management education upon individual performance and in this section, the relative respective research papers are introduced. Individual performance and organisational performance are related (Bennett & Langford, 1980).

Bennett & Langford (1980) argue that the link between individual managerial effectiveness and organisational effectiveness mainly occurs at the top management level. Even then it depends on the personality of the individual to achieve objectives through other people.

Burke & Day (1986) studied, in a meta-analysis of 70 managerial training studies, the effectiveness of management and leadership development programmes and found them, on average, moderately effective. They suggest more research in this area.

Boyatzis (1993) argues that many individuals in a position of leadership do not demonstrate it and frustrate members of the organisation and stakeholders although they possess the required competencies to lead effectively. He proposes that management education should encourage individuals to act as leaders and not just transfer management skills.

Strebler & Bevan (1996) studied competence-based management development and found that this approach had a high perceived value, although there was little evidence of improved capabilities.

Boyatzis et al. (1996) argues for a more skill-based MBA programme to increase the level of competences in a targeted way.

Rosenthal et al. (1997) carried out qualitative and quantitative research in a leading super market. He discovered that a quality and service excellence training programme has a positive effect on individuals.

Thomson et al. (1998) surveyed MBA alumni in UK and were disappointed that only about 20% of the respondents saw their role in developing others as very important.

Guest et al. (2000) confirmed, in a study, the relationship between high-commitment human resource strategies and positive employee responses.

Baruch & Peiperl (2000) studied the impact of an MBA on career advancement. They discovered that MBA studies help graduates to gain a competitive advantage in comparison to their counterparts without an MBA. The advantages concerned are competencies: therefore, business schools do achieve their aim by producing better managers.

In the US, Leonhardt (2000) discovered that Boston Consulting Group consultants hired without an MBA were, on average, better evaluated than their colleagues with an MBA. Pfeffer & Fong (2002) report that McKinsey, as well as Booz Allen and Hamilton intend to hire fewer people with a MBA. They state that business schools are big business, but there are substantial questions on the effects of their management education on the graduates' career and management practices. This may suggest that an MBA is more or less worthless, but one could argue that perhaps consultants working for consulting companies need other capabilities than management knowledge and leadership.

Analoui & Hosseini (2001) studied the effects on management education on individual managerial effectiveness in Iran. They conclude that business administration programmes and pedagogy employed promote skills and knowledge and make managers work more effectively.

Perren & Grant (2001), researching in SMEs, discovered that managers find the traditional teaching in business schools is not useful in addressing their business issues.

The UK Council for Excellence in Management and Leadership (CEML, 2002, p. 42) argues that *“there is no real evidence that education leading specifically to qualifications in business and management has a causal link with superior performance of the individual”*.

Cheese et al. (2007) argue that high performance companies develop the potential of top executives by providing them with individual skills and knowledge. This leads to increased collective abilities in the company.

Most of the previous research results confirm the positive impact of management education upon individual performance. The value of MBA studies is, however, disputed.

In summary, the aim of management education is the improvement of management knowledge and skills and thus the performance of business leaders. Well educated and effective business leaders, middle managers and employees are one key to the sustained success and performance of enterprises as the society's wealth creators.

5.6.6 The impact of age and seniority upon strategic management practice and performance

The outcome of the literature research regarding age and seniority (= number of years in current position; see also section 6.4.3) in context with management education, strategic practice and performance was limited. Some papers on research results regarding the relation of employee's age or seniority and job performance could be found. Waldman & Avolio (1986, p. 36) conducted a meta-analysis for non-professionals and professionals and discovered that "*the widespread belief that job performance declines with age was not strongly supported*". Some evidence pointed to the increase of performance with age. Differences were traced to varying performance measures. McEvoy & Cascio (1989) reviewed research result from various studies and concluded that age and job performance are generally unrelated. Ng & Feldman (2008, p. 392) in further research with employees, determined the relationship of age with "*ten dimensions of job performance*" such as creativity or safety performance. The results were mixed, either positive or negative relations or no relation at all.

Research results regarding the relation of executives' age and seniority with company performance could not be found.

5.7 Summary

This chapter has defined management knowledge, described the history of management education, the education system in Germany, the postgraduate options for management education and pedagogical approaches. The chapter continues with the literature review regarding strategic management practice and management education and their relation with performance.

The higher education system in Germany is still in the transition period of compliance with the Bologna Accord signed by all Ministers of Education of the European Community in 1999 (BMWF, 2008b). Until then, the higher education was split between a more praxis orientated and a more theoretically orientated system. The universities of applied science offer a more practical approach, whereas the other universities provide more theoretical courses of study. In future, both types of universities can offer undergraduate (e.g. BS) and graduate studies (e.g. MS).

Inquiries suggest that German universities lack general management or strategic management courses in their curricula (Ramirez, 2004). This applies even more to engineering faculties.

Figure 5.9 summarises the issues and conclusions drawn, the contribution to the research project made with this chapter, the knowledge gaps identified and research questions arising.

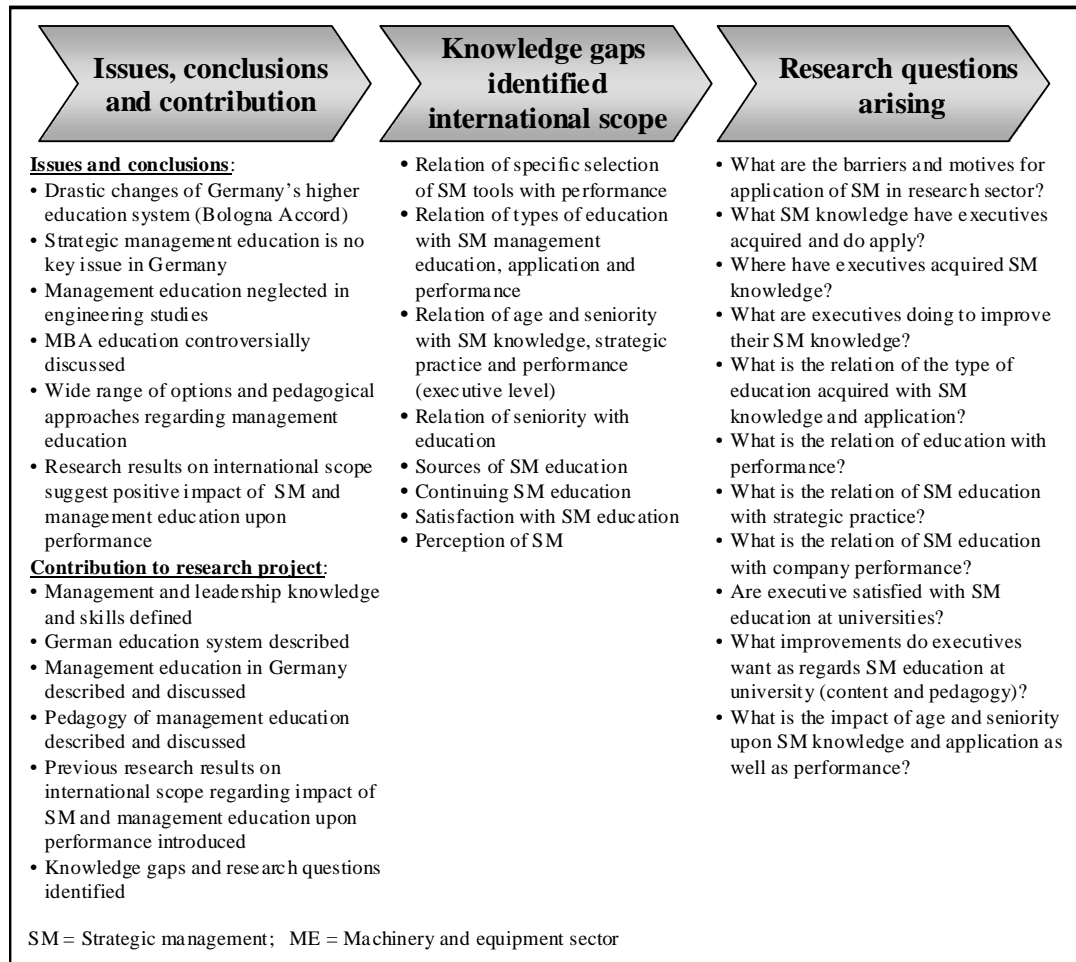


Figure 5.9: Chapter contribution and summary

Source: Developed by researcher

The next chapter goes on to define the research objectives and questions and to describe and discuss the philosophies and elements of social science and derive the design of the field research of this project.

6 Research design and processes

“What, Sir, you would make a ship sail against the wind and currents by lighting a bonfire under her decks? I pray you to excuse me, I have no time to listen to such nonsense.”

Napoleon Bonaparte (Quoted in Handelsblatt, 2005, p. 67)

6.1 Introduction

Chapter 5 explored the state and practice of management education in Germany. In addition, the impact of management practice and management education was researched in a literature review with international scope. The aim was to discover the state of knowledge and to identify knowledge gaps.

Figure 6.0 list the objectives for this chapter.

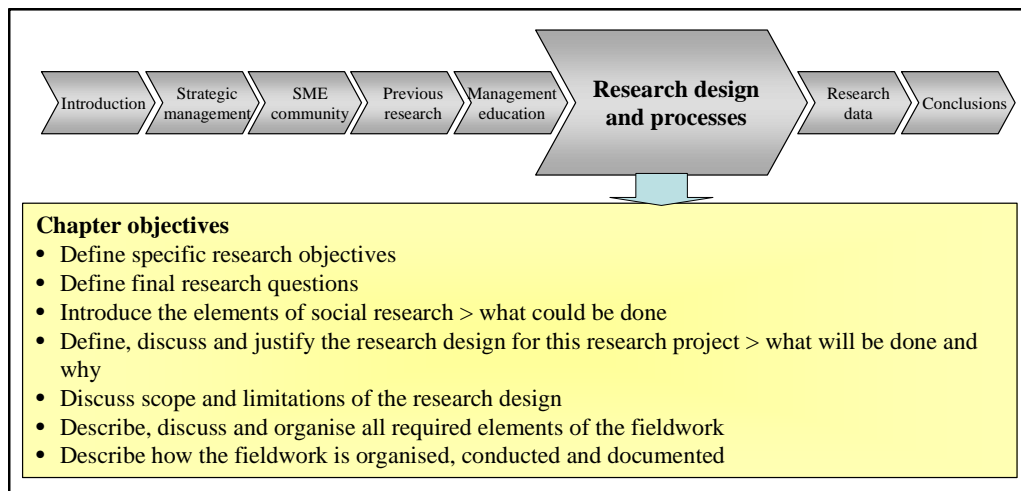


Figure 6.0: Objectives chapter 6

Source: Developed by researcher

Chapter 6 is based upon the knowledge gaps identified and questions that arose in chapters 1 to 5 by defining the specific research objectives and research questions. This chapter continues to discuss in detail the research design and methods to be applied to the research project based upon the available elements of social research.

6.2 Deriving and defining the research questions and objectives

The following sub-sections presents the critical assumption made, discusses and lists the research questions and objectives.

6.2.1 Critical assumption made

The critical assumption stated below is based upon the findings in the literature research with international scope is the foundation for the specific research objectives and research questions.

Critical assumption:

Lack of strategic management leads to the neglect or misuse of the strategic management processes and tools and may induce underperformance of the business.

6.2.2 Specific research objectives

In section 1.9, the general objectives of this research project were introduced. Saunders et al. (2003, p. 25) suggest defining a set of specific research objectives “*as evidence of a researcher’s clear sense of purpose and direction*”. They recommend that these objectives be derived from the general focus of the research question. In this research project, the critical assumption is the basis for the specific research objectives which are to:

- Explore the state of strategic management knowledge of top executives in the machinery and equipment sector.
- Find out how these executives acquired their knowledge of strategic management.
- Discover how the executives apply their strategic management knowledge in praxis.
- Explore the relationship of the type of graduate education, with the acquisition and application of strategic management, as well as performance outcome.
- Explore the relationship of strategic management praxis with performance outcome.
- Explore the relationship of age and seniority with strategic practice and performance.

6.2.3 Research questions derived and defined

One of the key tasks in a research project is the definition of clear research questions. Saunders et al. (2003) emphasise the importance of these as they have impact on the definition of the research strategy and methodology of data collection and largely determine the clarity of the conclusions drawn from the data collected.

From the literature research, the knowledge gaps identified and questions that arose in the previous chapters, the critical assumption made and the objectives and scope of the research project, the research questions and sub-questions were derived as listed below:

Research question 1

What is the state of management education and, in particular, strategic management education of executives in the sector researched?

- a) *What strategic management knowledge was acquired in which area of education and via seminars or self-study?*
- b) *What is the relation of the type of education with the acquisition of strategic management knowledge?*

- c) *How do the responding executives rate the strategic management knowledge of their colleagues on the top executive level and the hierarchical level below?*
- d) *Are the responding executives satisfied with the general and strategic management education during undergraduate or graduate studies? If not, why?*
- e) *How much time do executives spend on continued education regarding general and strategic management and which medium is used to acquire knowledge?*

Research question 2

What is the current practice in strategic management in the sector researched?

- a) *What strategic management tools are applied in praxis?*
- b) *What is the relation of the type of education with the application of strategic management knowledge?*
- c) *What is the approach to strategic management in responding companies?*
- d) *What are the motives and obstacles to strategic planning process?*
- e) *What are the organisations and individuals doing to improve strategic management in their company?*
- f) *What is the perception or understanding of the executives regarding strategic management?*
- g) *What kind of challenges do the executives see ahead and how do they cope with them?*

Research question 3

What is the relation of education and strategic management practice with the performance outcome?

- a) *What is the relation of education with the performance outcome?*
- b) *What is the relation of continued strategic management education with the performance outcome?*
- c) *What is the relation of strategic management practice with the performance outcome?*

Research question 4

What is the relation of the managers' age with strategic management knowledge, practice and performance outcome?

- a) *What is the relation of the managers' age with strategic management knowledge and practice?*
- b) *What is the relation of the managers' age with the performance outcomes of the company they lead?*

Research question 5

What is the relation of the managers' seniority with strategic management knowledge, practice, performance outcome and education?

- a) *What is the relation of the managers' seniority with strategic management knowledge and practice?*
- b) *What is the relation of the managers' seniority with the performance outcomes of the company they lead?*
- c) *What is the relation of the managers' seniority with their education?*

Research question 6

What is the relation of the company size with strategic management knowledge and practice?

- a) *What is the relation of the company size with strategic management knowledge?*
- b) *What is the relation of the company size with strategic management practice?*

The definition of research objectives and research question are very important elements of a research project as they drive and determine the research design and process and, of course, the outcome and results. The central and most important research question is question number 3 “What is the relation of education and strategic management practice with the performance outcome?”

The next section introduces the world of social research.

6.3 Fundamentals and elements of social research

Throughout history, every society has developed some kind of procedure to collect and evaluate data. Evidence was found that the Egyptians c. 200 B.C. collected data on households. In other cultures, such as China, Persia, Greece, or the Roman Empire, data collection was also carried out and statistics prepared in the areas of agriculture, trade, or population (Schnell et al., 2008). In modern times, numerous scientists developed philosophies and methods for research in all kind of social areas.

The following sections introduce the philosophies and methods of modern social science. Beforehand, some basic terms of social science will be defined:

Research

Webster’s Dictionary defines research as “*a careful, patient, systematic, diligent inquiry, or examination in some field of knowledge, undertaken to establish facts or principles*” (Webster, 1983, p. 1539). This short statement describes clearly what research is all about and how it should be approached.

Epistemology

The Greek word for knowledge is episteme (Επιστημη) (Meyers, 2008). From this word the science of epistemology was derived. DeRose (2008, p. 1) defines epistemology as “*the branch of philosophy that deals with questions concerning the nature, scope and sources of knowledge*” or in short “*the theory of knowledge*”. Crotty (1998, p. 3) defines epistemology “*as a way of understanding and explaining how we know what we know*”.

Ontology

This term is derived from the Greece word of “being” (εἶναι). The term was formed in the middle of the seventeenth century for the essence and characteristics of being (Meyers, 1990). Crotty (1998, p. 10) defines ontology as *the “study of being”*. Ontology is concerned with the question “*what is*”. It describes the “*nature of existence*” and the “*structure of reality*”. Ontology (what is the status) goes along with epistemology (what does it mean).

In the following, elements of the research process are described and discussed. Unfortunately, the literature of social science does not provide a common terminology. e.g. Crotty (1998, p. 3) defines ethnography as a methodology, Saunders et al. (2003, p. 83) considers it a research strategy, Remenyi et al. (1998, p. 42) calls it a tactic and for Easterby-Smith et al. (2002, p. 56) it is research design. In order to avoid confusion, the researcher uses the terms defined and described in the following sub-sections.

6.3.1 Research philosophy

A research philosophy can be characterised as a general direction of developing knowledge. Easterby-Smith et al. (2002) point out the importance of a research philosophy for the outcome of a research project and provide three reasons for it:

- A research philosophy can help the researcher in clarifying the design of the research.
- The knowledge about research philosophies can help the researcher regarding validity of his research design.
- The knowledge about research philosophies can help the researcher in identifying and creating a research design beyond the existing experience.

Burrell & Morgan (1979, pp. 3-7) characterise the approaches or philosophies of social science in the ontological, epistemological, human and methodological context. Figure 6.1 depicts the subjective and objective dimensions for the four sets of “*assumptions relevant to understanding of social science*”. The nominalist is often equated with the conventionalist. They assume that the “*social world external to individual recognition is made up of nothing more than names, concepts and labels used to structure reality*”. On the other hand, the realist recognises the world as being made up of “*hard, tangible and relatively immutable structures*”. The anti-positivist sees the social world as essentially relativistic which can only be understood if the researcher is directly involved in the activities to be studied. The positivist epistemology “*seeks to explain and predict what happens in the social world by searching for regularities and relationship between constituent elements*”. The voluntarist views man as “*completely autonomous and free-willed*”. Alternatively, a determinist “*regards man and his activities as being completely determined by the situation or environment in which he is located*” (Burrell & Morgan 1979, pp. 3-7). The ideographic view of social science is based on the assumption that the social world can only be understood by obtaining first hand knowledge of the subject

investigated. On the other hand, the nomothetic view emphasises the importance to base the research on systematic protocol and techniques.

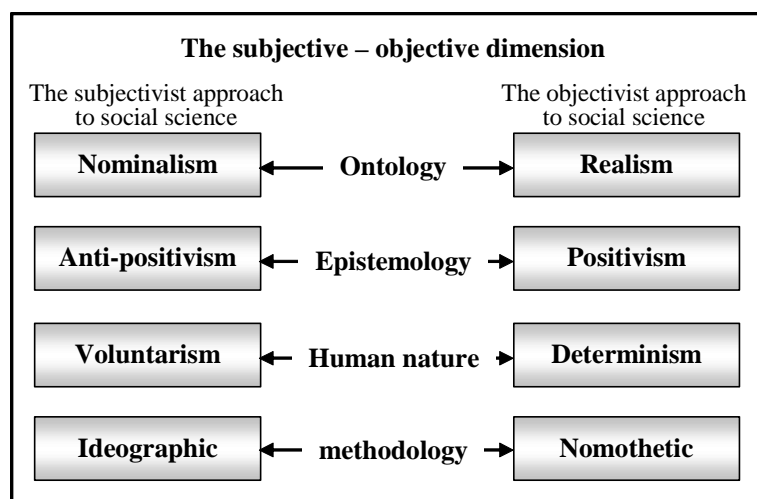


Figure 6.1: Scheme for analysing assumptions about nature of social science

Source: Burrell & Morgan (1979)

Saunders et al. (2003) define and describe three different research philosophies: positivism, realism and interpretivism. The positivist research adopts the points of view of a natural scientist. The research object is seen as a social reality and the outcome of the research is a generalisation comparable to those of physical researchers. The methodology is highly structured and quantitative to allow statistical analysis. Remenyi et al. (1998, p. 33) state: *“The researcher is independent of and neither affects nor is affected by the subject of the research”*. According to Weber (2004), in a positivistic approach and in the ontological research context, the person (researcher) and the object (the phenomena) are separate, independent things. Thus, positivistic ontology is dualistic in nature. In the epistemological research context, he states (Weber, 2004, p. 4) *“the objective reality exists beyond the human mind”*. Positivistic epistemology is trying to build that knowledge of a reality. It believes *“that the human experience of the world reflects an objective, interdependent reality and that this reality provides the foundation of the human knowledge”* (Weber, 2004, p. 6).

Realism in social science and management research is based upon the assumption that there are effects, forces and processes that affect attitudes, views and behaviour of persons, who may not necessarily be aware of these influences. Realism is related to positivism in respect to the objective view of aspects in social science. Nevertheless, realism does not see the people themselves as objects to be studied in the style of natural science. Realism recognises the people’s subjective reality in their socially constructed context (Saunders et al., 2003).

The interpretivistic researcher may argue that the social as well as the business environment is too complex and cannot be generalised. Over-structuring and statistics may lead to a loss of valuable information. An interpretivistic researcher is more inclined to use qualitative research methods (Saunders et al., 2003). According to Weber (2004, p. 4), in an interpretivistic approach and in the ontological research context, the *“person*

(researcher) and reality are inseparable (life-world)”. In the epistemological research context, he states “knowledge of the world is intentionally constituted through a person’s lived experience” (Weber, 2004, p. 4).

6.3.2 Research process

The research process is the overall proceeding of the research project. The researcher begins with an area of interest not yet explored. Information is gathered and studied. The research object becomes clearer and can be described. Finally, it ends in a desire and passion to research on this particular topic. The research project with clear objectives is started and a time table established. The literature search is launched and literature is collected, studied and mapped. After the research questions are set, the design of the research project can be started. The research process ends with the data evaluation and the conclusions.

Saunders et al. (2003) suggest a systematic approach in collecting, interpreting and discussing data. Throughout the whole research process, a careful and diligent working style should be applied in order to obtain the quality required. After all, the purpose of research is to explore new areas of interest

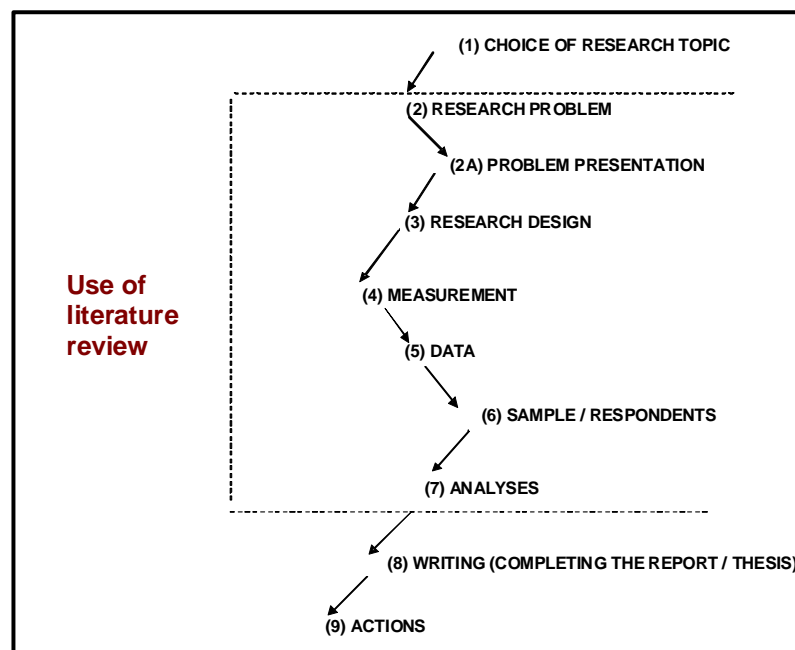


Figure 6.2: The research process

Source: Ghauri (2008)

Ghauri (2008) describes the research process in nine steps (Figure 6.2). The research process starts with the choice of the research topic which is narrowed down to the definition and presentation of the research problem as well as the basic research questions. Step 3, research design, describes in detail the approach and methodology for answering the research questions and solving the research problem. Ghauri & Grønhaug (2002) describe the choice of the research design as a bridge between the research activities at the conceptual and empirical level (Figure 6.3). Step 5, measurements, provides the concept

and metrics for the planned empirical research. Data sources, data collection and sampling procedures are the core elements of the field research. For the analysis of the collected data, various systems and procedures can be applied. In step 8 the research report or thesis is compiled, followed by action which can be presentations, publications, or a congress. The literature review is involved from step 2, research problem, through 7, analyses.

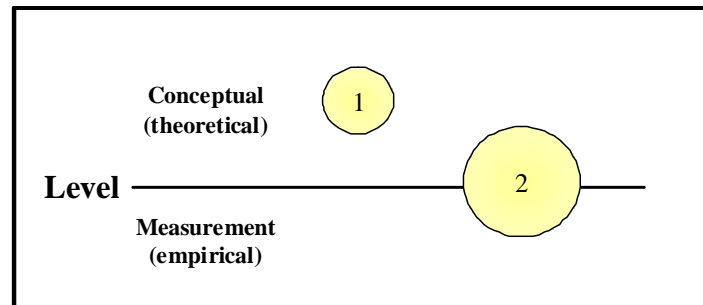


Figure 6.3: Two levels of research

Source: Ghauri & Grønhaug (2002)

There is literature from primary (e.g. reports, research results, theses), secondary (e.g. books, journal articles) and tertiary sources (e.g. dictionaries, encyclopaedias) to be considered (Saunders et al., 2003). The comprehensive literature review helps to make the transition from the pre-understanding to the complete understanding of the research problem. Saunders et al. (2003, p. 44) state that the “*critical literature review will form the foundation on which the research is built*” and describes the literature review process in an iterative cycle (Figure 6.4).

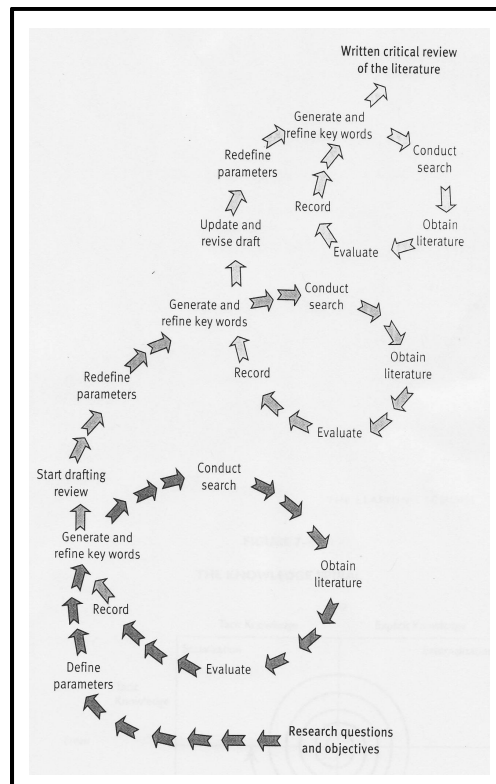


Figure 6.4: The literature review process

Source: Saunders et al. (2003)

Gummesson (1991) describes the sources of pre-understanding and understanding of

research problems (Figure 6.5). The pre-understanding is determined by one's own experience in the area of the research and by others' experience, through intermediaries such as literature or personal information. With the pre-understanding, continual use of others' experience, personal involvement and by using methods to assess the others' research experience, full understanding of the research problem can be reached.

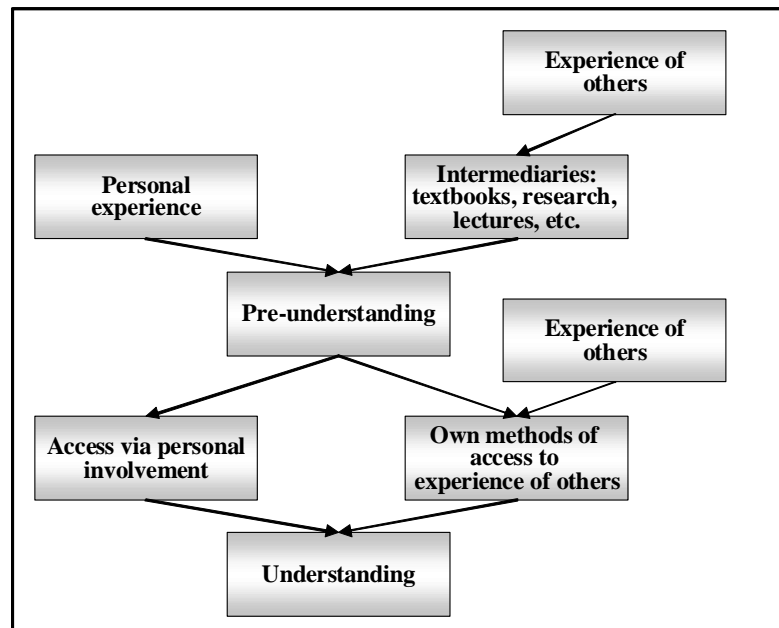


Figure 6.5: Sources pre-understanding and understanding

Source: Gummesson (1991), adapted by researcher

Crotty (1988, pp. 4-5) suggests 4 elements for designing the research process that “*inform one another*” as depicted in Figure 6.6. He considers objectivism, constructionism, subjectivism as epistemologies “*embodied in many theoretical perspectives*”. The latter are positivism, interpretivism (symbolic interactionism, phenomenology, hermeneutics), postmodernism, etc. The theoretical perspective “*informs*” the methodology (survey, ethnography, etc.) and finally the individual methods (sampling, observation, etc.)

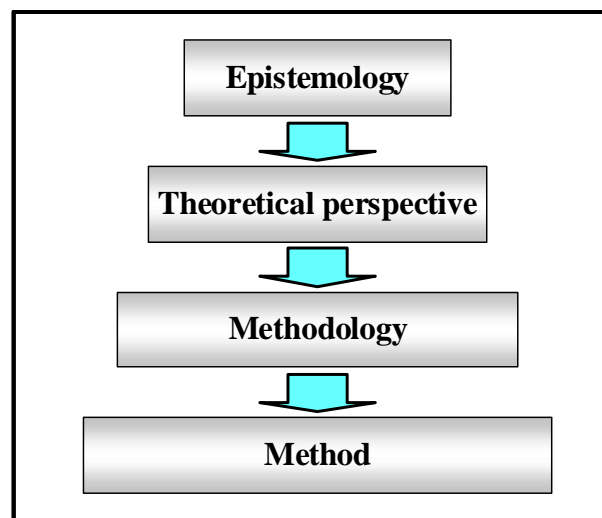


Figure 6.6: The process of social research

Source: Crotty (1998)

6.3.3 Research approach

A research approach is the way or mode of the research. Two different approaches can be applied in social science, the inductive approach and the deductive approach. Deduction is defined as “*act of reasoning from a known principle to an unknown, from the general to the specific, or from a premise to a logical conclusion*” (Webster, 1983, p. 474). Remenyi et al. (1998) describe induction as starting from a broad perspective and then narrowing it down to a specific instance. A deductive approach in business and management research is applied, if the phenomenon is more or less known and hypotheses and models can be established. The research effort is to test the theory (Saunders et al., 2003).

The opposite is the inductive research approach. Webster (1983, p. 934) defines induction as “*the process of reasoning or drawing a conclusion from particular facts or individual cases*”. An inductive approach in social science research is applied, if little is known about the phenomenon or behaviour within the research population. The research effort is to build a theory (Saunders et al., 2003). Some researchers in social or management research combine both approaches in the same research project.

6.3.4 Mode of knowledge production

Gibbons et al. (1994) describe the research scheme, or mode, for the production of knowledge. They define mode 1 and mode 2 research. The first is the traditional way of producing knowledge as a result of an academic agenda, residing in universities guarded by “*elite gatekeepers*” (Transfield & Starkey, 1998, p. 347). Mode 2 research requires trans-disciplinarity and teamwork and it interacts between the actors in theory and praxis in the process of knowledge production.

6.3.5 Research strategy

Saunders et al. (2003, p. 90) define a research strategy as “*a general plan of how the research questions will be answered*”. They list and describe different research strategies that are briefly introduced below.

The experiment is the classical form in natural science, but also applied by social scientists. It involves a hypothesis, selection of samples from a known population, experimental conditions, planned and measured variables.

The survey is associated with the deductive approach and is a common strategy in business and management research. It is usually carried out with questionnaires and structured interviews, but also with structured observation.

The case study is a popular teaching and learning device based upon real people, companies and situations (McLeod, 2004), but it is also used in social science research. It can be used to establish valid and reliable evidence or to create a story, or narrative description, of the situation being studied (Remenyi et al., 1998). Case studies answer the question types how and why and focus on contemporary events (Yin, 2003). Data

collection in case studies may include questionnaires, interviews, observation and document analysis.

The researcher may introduce the micro case study, a strategy using quantitative and qualitative data from a questionnaire survey. Qualitative data can be obtained through open questions via assessing, coding and evaluating the answers. Qualitative data can be enriched by observations and documents publicly available. With micro case studies quantitative research can be enriched with qualitative data and to some extent methodologically triangulated (Grossnickle & Raskin, 2000; Easterby-Smith et al., 2002; Modell, 2005; Mayring, 2001).

Grounded theory is predominantly used for inductive approaches, to build a theory from a large amount of unstructured qualitative data. The grounded theory method was developed by Glaser and Strauss in 1967 for the handling of large amounts of non-standard data (Turner, 2001).

Ethnography is also used for an inductive research approach. It has its roots in the field of anthropology. Ethnographic requires “*the researcher to become part of the tribe and fully participate in the society*” (Remenyi et al., 1998, p. 51).

Action research is a strategy with dual aim. Firstly, it should bring action and change to a community, organisation or programme and secondly it should increase the understanding and knowledge of the research community (Dick, 1993). Reason & Bradbury (2002, p. 2) define the primary purpose of action research as the production of “*practical knowledge that is useful to people in the every conduct of their lives*”.

First introduced in 1950s, so called repertory grids are an additional strategy in social research. In management research, they are used for the evaluation of management education programmes, assessment schemes, etc. (Easterby-Smith et al., 1996).

6.3.6 Research time horizon

Easterby-Smith et al. (2002) describe two types of research time horizons. Research projects with a longitudinal horizon collect data over a certain period of time. The aim is to analyse a certain phenomenon or behaviour and their fluctuation over a certain period of time. In contrast, cross sectional studies are “snapshots” at a given time.

6.3.7 Research methodology

Webster (1983, p. 1134) defines methodology as “*a system of methods, as in any particular science*”. Easterby-Smith et al. (2002, p. 146) use the term “methodology” in defining “*methodological triangulation*” which combines qualitative and quantitative methods of data collection. The researcher uses the term methodology to describe qualitative and quantitative research. Both combine research methods for data collection, processing, analysis and evaluation.

6.3.7.1 Qualitative research methodology

Qualitative research methodology has its roots in the late 1920s when social scientists enhanced the status of sociology as a science by adopting techniques from the natural science model (Atkinson & Shaffir, 1998). Lofland & Lofland (1984, p. 1) characterise qualitative research as: *“The data collection technique of participant observation and / or intensive interviewing and data analysis techniques that are non-quantitative. In the most basic sense, qualitative research is about observing events in their natural setting and reporting them in a systematic way”*.

Dobbins et al. (1999, p. 43) describe the assumptions underlying qualitative methods as follows:

- *“Multiple realities exist in any given situation, the researcher's, those of the individuals being investigated and the reader or audience interpreting the results; these multiple perspectives, or voices, of informants (subjects) are included in the study.*
- *The researcher interacts with those he studies and actively works to minimise the distance between the researcher and those being researched.*
- *The researcher explicitly recognises and acknowledges the value-led nature of the research.*
- *Research is context-bound.*
- *Research is based on inductive forms of logic; categories of interest emerge from informants (subjects), rather than being identified a priori by the researcher.*
- *The goal is to uncover and discover patterns or theories that help explain a phenomenon of interest.*
- *Determinations of accuracy involve verifying the information with informants or triangulating among different sources of information (e.g., collecting information from different sources)”*:

In-depth interviews, on site observations and document analysis are common tools for qualitative research in business and management. Saunders et al. (2003) and MRS (2003) define characteristics and requirements for interviews, provide guidelines and emphasise the ethical aspect of the interview process.

6.3.7.2 Quantitative research methodology

Quantitative research is a research methodology that uses mathematical models and statistical methods to evaluate data received, e.g. from surveys with questionnaires. The possible answers of the questionnaire are coded. The data is entered in a software programme, e.g. SPSS or R-Command and analysed or tested for relationships between different empirical observations.

Grossnickle & Raskin (2000) describe the strength of quantitative research. It delivers

reliable and accurate results of the population being studied. The research can be automated, e.g. via the internet and carried out on a large scale. Statistical analyses can be made and interdependencies discovered. The executed research is replicable to another population or traceable for a population over a longer period of time. Statistical techniques are the backbone of quantitative research. Various software programmes facilitate the documentation, analysis and evaluation of the empirical data.

Dobbins et al. (1999, p. 42) describe the assumptions underlying quantitative methods as follows:

- *“Reality is objective, out there and independent of the researcher -- therefore reality is something that can be studied objectively.*
- *The researcher should remain distant and independent of what is being researched.*
- *The values of the researcher do not interfere with, or become part of, the research -- research is value-free.*
- *Research is based primarily on deductive forms of logic and theories and hypotheses are tested in a cause-effect order.*
- *The goal is to develop generalizations that contribute to theory that enable the researcher to predict, explain and understand some phenomenon”.*

In business and management research, the phenomena in the research context is often known to some extent to the researcher. Hypotheses, assumptions, concepts and models can be established prior to the fieldwork. The aim of the research is then to gather and analyse data and compare it with the hypotheses, assumptions, concepts and models established. In this area of research quantitative methods and statistical analyses prevail.

6.3.7.3 Qualitative versus quantitative methodology

For years, social scientists have argued about appropriate research approaches and methods, qualitative versus quantitative research. While quantitative research analyses numerical data, qualitative research is involved with words, pictures or objects. There are advantages and disadvantages in both basic research methods. Neill (2006) lists features of both research methods as depicted in Table 6.1. The researcher has met social scientists with diametrically opposite opinions. One group strongly suggests qualitative methodology only, since the data received is richer. The other group rejects qualitative methodology as too subjective and recommend the use of statistical methods only.

Qualitative	Quantitative
"All research ultimately has a qualitative grounding" Donald Campbell	"There's no such thing as qualitative data. Everything is either 1 or 0" Fred Kerlinger
The aim of qualitative analysis is a complete, detailed description.	In quantitative research we classify features, count them and construct statistical models in an attempt to explain what is observed.
Recommended during earlier phases of research projects.	Recommended during latter phases of research projects.
Researcher may only know roughly in advance what he/she is looking for.	Researcher knows clearly in advance what he/she is looking for.
The design emerges as the study unfolds.	All aspects of the study are carefully designed before data is collected.
Researcher is the data gathering instrument.	Researcher uses tools, such as questionnaires or equipment to collect numerical data.
Data is in the form of words, pictures or objects.	Data is in the form of numbers and statistics.
Qualitative data is more "rich", time consuming, and less able to be generalised.	Quantitative data is more efficient, able to test hypotheses, but may miss contextual detail.
Researcher tends to become subjectively immersed in the subject matter.	Researcher tends to remain objectively separated from the subject matter.

Table 6.1: Features of qualitative and quantitative research

Source: Neill (2006)

Shaffir & Stebbins (1991) describe the relationship of qualitative and quantitative research (Figure 6.7). Most of the fieldwork in social science research projects is exploratory. The individual doing research usually has a certain orientation, but is open-minded as regards data and data sources. Both methods, quantitative and qualitative, can be utilised in an inductive approach. However, research projects coping with little known phenomena predominantly generate qualitative data.

Data can be generalized and quantified or analysed and discussed with the aid of the grounded theory.

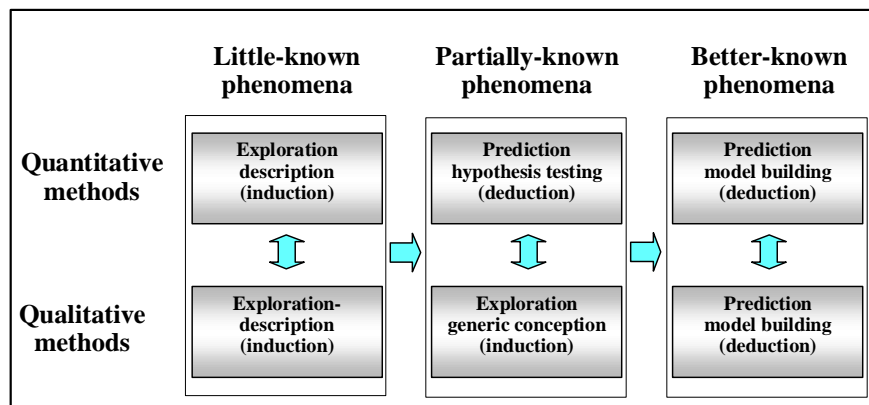


Figure 6.7: The relationship of qualitative and quantitative Methods

Source: Shaffir & Stebbins (1991)

Ghauri (2008) lists the difference in emphasis in qualitative versus quantitative research. He characterises qualitative methodology as focusing and interpreting, on understanding certain phenomena. Observation and measurement are carried out in the natural setting with an insider's view. The research is explorative, process orientated, inductive and with a holistic perspective. In contrast, quantitative research emphasises on testing, verification of hypotheses and assumptions. The research process focuses on facts, logics, analytics, causality and controlled measurement with an outsider's view.

Qualitative methods	Quantitative methods
Emphasis on understanding	Emphasis on testing and verification
Focus on understanding from respondent's/ informant's point of view	Focus on facts and/or reasons of social events
Interpretation and rational approach	Logical and critical approach
Observations and measurements in natural settings	Controlled measurement
Subjective 'insider view' and closeness to data	Objective 'outsider view' from data
Explorative orientation	Hypothetical-deductive; focus on hypothesis testing
Process orientated	Causal and result orientation
Holistic perspective	Particularistic and analytical
Generalization by comparison of properties and contexts of individual organism	Generalization by population membership

Table 6.2: Difference in emphasis in qualitative versus quantitative research

Source: Ghauri (2008)

6.3.7.4 Combining qualitative and quantitative methodology

Cook & Campbell (1979, p. 572) argue that quantitative research has its limitations and state: *“Field experimentation should always include qualitative research to describe and illuminate the context and conditions under which research is conducted”*.

Grossnickle & Raskin (2000) suggest that qualitative research complements the quantitative approach. Interesting, spontaneous responses, opinions and gestures from respondents may lead to a new aspect within the research context. Observations made during interviews or visits enrich the research results.

Combining qualitative and quantitative research method is often used in social science to enrich and improve the quality of the research, to test hypotheses, or to confirm and support empirical research results. The use of multiple, but independent research methods is known as triangulation. This term is borrowed from navigation, where the actual location is taken from three reference points (Smith, 1975).

Easterby-Smith et al. (2002) describe different types of triangulation:

- Theoretical triangulation; models taken from one discipline are used to explain a situation in another discipline.
- Data triangulation; data is collected over a different time or from different sources.
- Triangulation by investigators; different researchers collect data in the same sector.
- Methodological triangulation; combination of quantitative and qualitative data collection via questionnaires, interviews, telephone survey, case studies, etc.

Modell (2005, p. 233) suggests the triangulation of quantitative survey methods with case studies or vice versa to *“add to a more holistic and richer contextual understanding”*. Mayring (2001, p. 7) describes this combination of quantitative and qualitative research methods as *“Vertiefungsmodell”* (validation model).

6.3.8 Research method

Saunders et al. (2003, p. 481) define a research method as “*a tool and technique used to obtain and analyse research data*”. They list methods of data collection which are sampling methods, use of secondary data, observations (and document analysis), interviews (structured, semi-structured, unstructured) and questionnaires.

6.3.9 Research design

The researcher would defines research design as the selection and assembling of all relevant elements of social science most appropriate to the planned research and capable of best satisfying all aspects and topics of the research project. The research design starts with the underlying philosophy and then defines the research process, approach, strategy, time horizon, methodology and individual methods.

Social science and research provide a rich variety of philosophies, strategies, or methods. The challenge is to orchestrate these in the best possible way. In the following section, the research design will be discussed and defined.

6.4 Defining the research design and scope for this research project and limitations to be considered

Crotty (1998, p. 2) cites two questions at a starting point for developing and designing research: “*First, what methodologies and methods will we be employing in the research? Second, how do we justify this choice?*” In the following sub-sections, the design of the research project is derived with the aid of the elements of social research described above and substantiated. Furthermore the scope for the research object, the German machinery and equipment sector, is set and limitations to the selected design are discussed.

6.4.1 The research design derived

With the aid of the “*research process onion*” developed by Saunders et al. (2003, p. 83) the research design for this research project is selected, briefly discussed and substantiated (Figure 6.8).

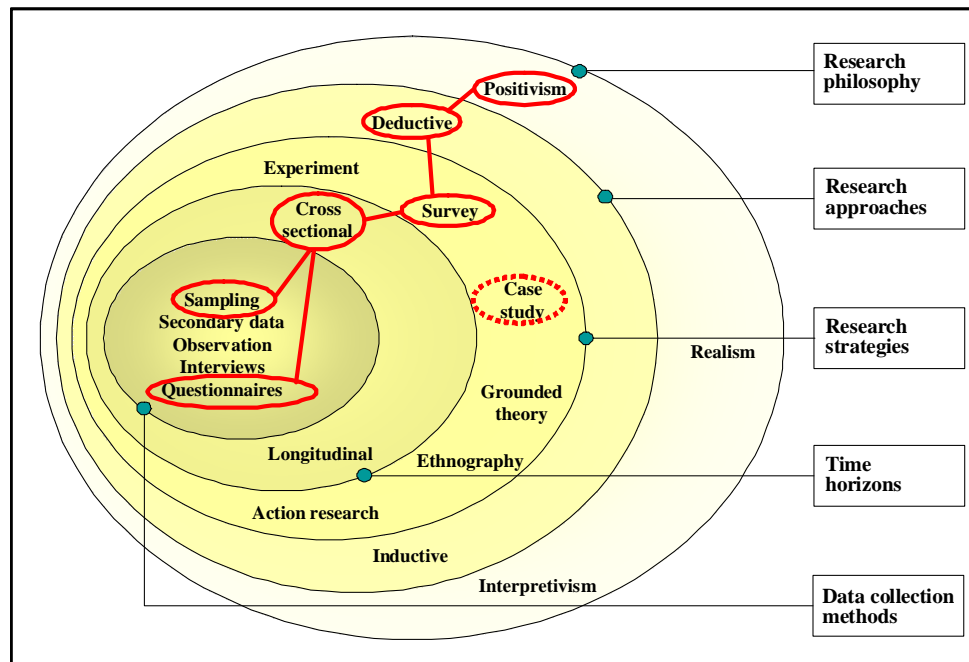


Figure 6.8: The research process “onion”

Source: Saunders et al. (2003) adapted by the researcher

Research philosophy

A research philosophy is dependent upon the way the researcher thinks and is intending to produce knowledge (Saunders et al., 2003). It helps the researcher to design and validate the research process (Easterby-Smith et al., 2002). This research project is best reflected by “positivism” as the underlying research philosophy as its aim is to work with observable social reality, taking the role of an objective analyst, making interpretations and testing relation of the data collected (Burrell & Morgan, 1979) and concentrating on a structured process and methodology for quantifiable observations, leading to statistical analysis (Gill & Johnson, 1997).

Research process

In this research, the suggestions made by Ghauri (2008) and Gummesson (1991) are adapted.

Research approach

Deduction is the best applicable approach to this research. The phenomenon is partly known from previous research effort. The hypothesis made with the critical assumption can be best tested (Shaffir & Stebbins, 1991; Saunders et al., 2003). However, there are also inductive elements possible. Through theory testing, new theories may evolve.

Mode of knowledge production

The research in the context of this PhD thesis is the product of one person, the researcher, who is supported by supervisors. Thus the production of knowledge is considered as mode 1, although there is also a constant interaction of the researcher between theory and praxis (Gibbons et al., 1994).

Research strategy

The deductive approach points to a survey (Saunders et al., 2003). However, the employment of case studies would also be an adequate research strategy. Nevertheless, the type of research questions and numerous tests of the hypothesis require a larger amount of data and demand a survey. To make use also of qualitative data from open questions, the micro case studies are employed in addition to the survey. The qualitative data enriches and complements the quantitative research (Grossnickle & Raskin, 2000)

Research time horizon

The structure of the research questions requires a cross sectional time horizon for this research project. Phenomena at a given time are studied.

Research methodology

The deductive research approach (Shaffir & Stebbins, 1991) seeks to test the theory and to understand phenomena (Dobbins et al., 1999), but also the selected strategy suggests a quantitative methodology for this research. In addition qualitative methodology is used in the form of micro case studies as indicated above.

Research methods

In light of the research design above, the best suitable research methods for data collection and evaluation are self-administered questionnaires, sampling methods and the SPSS 15 (SPSS, 2006) programme. To a certain extent, personal or telephone interviews are also employed. For the micro case studies, secondary data and observations are used. Collecting data through telephone interviews was initially considered but rejected. Trial telephone calls revealed that executives (and their secretaries) did not appreciate phone calls with the intention of a 15 minutes interview. As alternatives to SPSS 15, R-Project and PSPP software packages were considered but rejected since SPSS 15 is the standard software for statistical analysis at the University of Glasgow.

Figure 6.9 depicts the overall design and scope of this research project. It is split into 3 sections, desk research, field research and data analysis and evaluation. Section 1, the desk research, introduced and discussed in chapters 2 to 5, covers definitions, history and state of strategic management, facts and figures of the SME community in Europe and Germany, the peculiarities of the German “Mittelstand” and in particular facts, figures and challenges regarding the machinery and equipment sector, existing research results and empirical studies of the SMEs in Germany, as well as on an international scope the state, practice and impact of management education. Section 2, covers the field research and section 3, data analysis and evaluation.

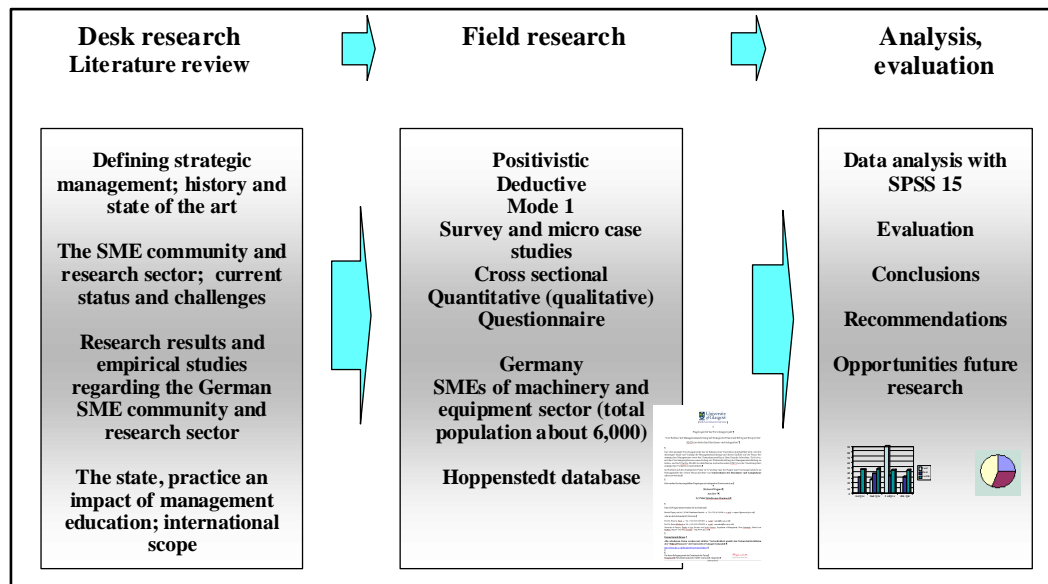


Figure 6.9: Scope of the research project

Source: Developed by researcher

6.4.2 The research sector SME's in the German machinery and equipment industry

The research is carried out in the German machinery and equipment industry sector, which is dominated by small and medium-sized enterprises. Mittelstand companies / SMEs with a size range of 10 to 500 employees are selected. As depicted in Figure 6.9 companies in that range employ about 90% of all employees in that sector (Wiechers, 1995). SMEs in this research sector are distributed all over the Federal States of Germany.

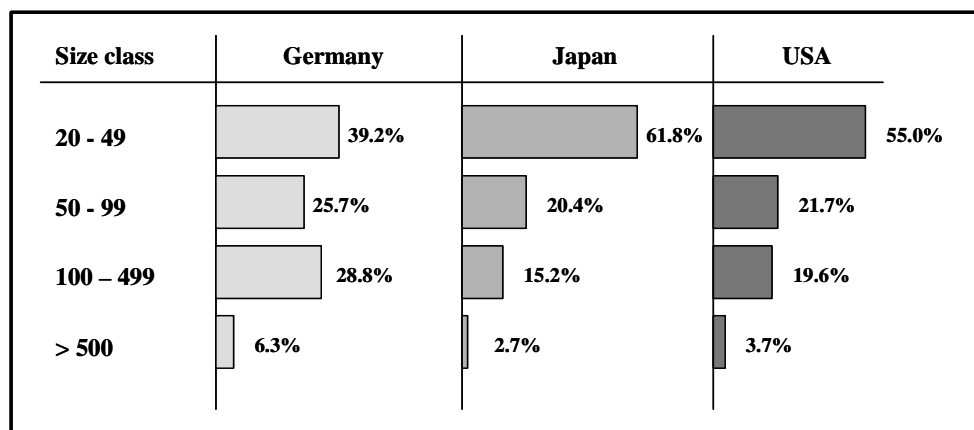


Figure 6.10: Enterprise sizes in the machinery and equipment sector

Source: Wiechers (1995)

Machinery and equipment is classified in Eurostat's subsection DK, divisions with so called NACE codes 29 through 29.72 (Eurostat, 2006b). Table 6.3 lists all types of machinery and equipment as well as other products such as appliances and weapons assigned to subsection DK.

For this research project NACE 10.6 – 10.60, manufacture of weapons and ammunition and NACE 29.7 – 29.72, manufacture of electric and non-electric appliances are excluded

from the survey. Weapons may be machines, but not in the context of forming, processing, or producing something. Household appliances, such as washing machines, are not typical machinery and equipment. The VDMA has also excluded appliances in their scope. Weapons and appliances are also mostly produced by large manufacturers. Ammunition is basically not a machine.

Subsection DK	Manufacture of machinery and equipment n.e.c.	ISIC
29	Manufacture of machinery and equipment n.e.c.	
29.1	Manufacture of machinery for the production and use of mechanical power, except aircraft, vehicle and cycle engines	291x
29.11	Manufacture of engines and turbines, except aircraft, vehicle and cycle engines	2911
29.12	Manufacture of pumps and compressors	2912x
29.13	Manufacture of taps and valves	2912x
29.14	Manufacture of bearings, gears, gearing and driving elements	2913
29.2	Manufacture of other general purpose machinery	291x
29.21	Manufacture of furnaces and furnace burners	2914
29.22	Manufacture of lifting and handling equipment	2915
29.23	Manufacture of non-domestic cooling and ventilation equipment	2919x
29.24	Manufacture of other general purpose machinery n.e.c.	2919x
29.3	Manufacture of agricultural and forestry machinery	292x
29.31	Manufacture of agricultural tractors	2921x
29.32	Manufacture of other agricultural and forestry machinery	2921x
29.4	Manufacture of machine tools	292x
29.41	Manufacture of portable hand held power tools	2922x
29.42	Manufacture of other metalworking machine tools	2922x
29.43	Manufacture of other machine tools n.e.c.	2922x
29.5	Manufacture of other special purpose machinery	292x
29.51	Manufacture of machinery for metallurgy	2923
29.52	Manufacture of machinery for mining, quarrying and construction	2924
29.53	Manufacture of machinery for food, beverage and tobacco processing	2925
29.54	Manufacture of machinery for textile, apparel and leather production	2926
29.55	Manufacture of machinery for paper and paperboard production	2929x
29.56	Manufacture of other special purpose machinery n.e.c.	2929x
29.6	Manufacture of weapons and ammunition	292x
29.60	Manufacture of weapons and ammunition	2927
29.7	Manufacture of domestic appliances n.e.c.	293
29.71	Manufacture of electric domestic appliances	2930x
29.72	Manufacture of non-electric domestic appliances	2930x

Table 6.3: Classification subsection machinery and equipment DK

Source: Eurostat (2006b)

6.4.3 Group of persons addressed in the research sector

Strategic management is the domain of the managing partner, managing director, or the top executive team. This assumption is supported by the researcher's experience from 1996 through 2009 as a consultant and rating analyst for about 40 German companies. The strategic planning process may be supported by staff members or external consultants, but the ultimate responsibility for strategic direction, rejection or approval of strategies and strategic plans lies with the top executive and the owners. If the top executive, or owner, lacks management education and has no knowledge of strategic management tools, it is unlikely that they will be applied. If they have no particular regard for strategic management, then strategic plans are unlikely to be found in companies they manage, even if the companies have subordinates with extensive strategic management knowledge. The following example supports this. The researcher, newly graduated as a MBA (1991),

recommended a strategic marketing plan to the managing partner (engineer, aged 63) in a SME with 360 employees in the machinery and equipment sector and promptly received the answer “*We do not need this gimmick*”. In the same company, the assistant to the managing partner had a similar experience when proposing a strategic plan.

GmbHs, or enterprises in another legal form, may have appointed a so called *Geschaeftsleitung* (executive board). Its members are the *Geschaeftsfuehrer* (managing director) and also executives at the second hierarchical level which is, depending upon the size of the company, a *Hauptabteilung* (main department) or *Abteilung* (department). The *Geschaeftsleitung* is the board for management decisions. However, highly important, strategic, or sensitive decisions are usually made directly by the *Geschaeftsfuehrer* alone or in cooperation with the *Gesellschafter* (share holders) in the so called *Gesellschafterversammlung* (shareholder’s meeting) (Bohl, 1990; Klauss & Mittelbach, 1984). Strategic plans, if at all used in SMEs, are prepared by the chief executives or executive team, or their preparation is delegated to a capable subordinate or an external consultant. Managers in the hierarchical level below the chief executives are asked for input to the strategic plan, such as competitive intelligence issues, marketing plans, etc.

The facts and arguments discussed above indicate and justify the single point approach “chief and senior executives” with a survey via questionnaire.

Of the c. 6,000 SMEs in the machinery and equipment sector, about 70% are GmbHs (limited liability company) and about 13% are GmbH & Co. KG’s (limited partnership with a limited liability company as general partner). The rest have legal status such as KG (limited partnership) or OHG (general partnership) or AG (stock corporation) (databyte, 2004).

The senior executive positions in the research sector are dominated by German nationals (c. 95%) and men (c. 95%) (databyte. 2004).

Depending upon the size of the enterprise, GmbHs (limited liability company) have one or two so called *Geschaeftsfuehrer* (executive directors); three is an exception. One of the *Geschaeftsfuehrer* is assigned as the *Sprecher der Geschaeftsfuehrung* (speaker of the executive directors). The title *Geschaeftsfuehrer* and its rights and duties are regulated in the so called *GmbH-Gesetz* (GmbH law) (Bohl, 1990)

The structure at the top level of GmbH & Co. KG’s (limited partnership with a limited liability company as general partner), is similar. The *Geschaeftsfuehrer* of the GmbH is, or are, usually the *Geschaeftsfuehrer* of the KG (limited partnership).

Executives also holding shares in a GmbH are called *Geschaeftsfuehrender Gesellschafter* (managing partners).

Depending upon the size and maturity of the organisation, SMEs in the machinery and equipment sector have two to four hierarchical levels, i.e. 1. Executive level, 2. Main department, 3. Department, 4. Sub-department or team or group.

Note regarding the term “seniority”:

During the research project it was discussed which term should be used to denote “the number of years served in the current position”. Alternative terms considered were seniority, tenure, experience, years of experience, length of service. The term “seniority” was selected for the following reasons:

- The German term denoting “the number of years served in the current position” is “Dienstalter” which is translated to English as “*length of service; seniority*” (Langenscheidt, 1981, p. 901)
- Webster (1983, p. 1651) defines seniority as “..... *precedence achieved by length of service in a given job*”
- For the German reader of this thesis, “Senioritaet” (seniority) is a common term. It is used in the context of human resource management “*Senioritaetsprinzip*” (principle of seniority) meaning that the individual with the most years in service has priority regarding promotion or pay increase (Gabler, 2005, p. 2656).
- The term “tenure” is derived from the Latin word “tenere” (to hold or possess) and “seniority” from the Latin word “senior” (the older). “Tenure” is generally defined and understood as “*the holding of an academic appointment after a period of probation*” or “*the conditions on which property is held*” (Chambers, 1993).
- Experience is not specific enough as it does not necessarily relate to years of service.
- The other terms are too verbose.

6.4.4 Limitations to the research design and process selected

Inevitably, as in any empirical research, there are some limitations to the research design and process of this research project. It is important to know these limitations, to discuss and to try to mitigate them (Remenyi et al., 1998). The limitations of the research design and process, the reasons of limitation and the mitigation of limitations are listed and discussed in the following Table 6.4.

Limitation	Reason of limitation	Mitigation of limitation
About 40% of total population (6,000) receives posted questionnaire, the remaining companies receive invitation participate via internet questionnaire	Cost and time constraints	Check bias of both variants (mail versus internet)
Snap shot versus research over a longer period of time	Nature of the research methodology selected, (cross sectional time horizon)	No mitigation possible
Self-administered questionnaire versus interview and observations	Selection of quantitative methodology, mostly appropriate for hypothesis testing	Some open questions; room for comments to allow for some qualitative information
Self-administered questionnaire may be misunderstood or not taken serious enough	Poor questionnaire design	Clear questions; test of questionnaire; pilot; motivating cover letter; low quality responses to be rejected Shaffir & Stebbins (1991)
Limited number of questions / variables	Time limit 15 minutes to fill out questionnaire, otherwise potential respondent may not touch it or gives up	Appropriate survey questions to cover all research question; appropriate coding MRS (2003); Foddy (1994); SPSS (2004)
Only some KPIs used in questionnaire; VDMA uses about 100 KPIs VDMA (2007b)		Appropriate selection of five KPIs to cover research questions; the ultimate quantitative key figure is profitability; qualitative key figure is continuous improvement rate
Key figures and KPIs only for one year (2007)		Extra question asks whether year 2007 was a normal business year
Database information may not be correct; unanswered returns	Poor maintenance of the database by provider	Selection of high quality data base
Return rate of mailing may be low	Poor questionnaire design, poor cover letter; no incentives	Appropriate design of questionnaire and cover letter; incentives to respond SPSS (2004)

Table 6.4: Limitations of the research design defined

Source: Developed by researcher

One key limitation is that the companies are questioned on a single year's performance only. In the course of the research design, it was considered avoiding this snap shot approach by asking for performance figures for three consecutive years. This idea was finally rejected for the following reasons:

- Executives may not remember key figures of the last three years or may not have the annual reports on hand.
- Executive may find it inappropriate to report key figures for three consecutive years.
- Issues 1 and 2 might substantially reduce the probability of completing the questionnaire.
- The time limit for completing the questionnaire is 15 minutes.
- 2007 was a normal business year unaffected by recession or by extraordinary GDP growth; growth rate of GDP in 2007 was 2.5% (VDMA, 2009)
- Limitation is mitigated by an additional question asking for anomalies such as extraordinary write offs or a windfall profit in the business year concerned and taking this into consideration in the data analysis (see section 7.4.3 and Figure Apx. 7).

Another key limitation is the reliability of self-administered questionnaires. The alternative of structured telephone interviews was considered and tested. This alternative, however, was rejected, since executives and their secretaries did not appreciate telephone calls at all (see 6.4.1). Budget constraints did not allow a larger number of personal interviews throughout Germany. There are pros and cons regarding self-administered versus interview administered questionnaires. Schnell et al., (2008) discuss and list the pros and cons of self-administered questionnaires:

Pros

- Interview errors can be avoided
- The answers are more honest as there is no risk of influence by the interviewer or by the interviewee
- The answers are considered; there is no time pressure.
- Anonymity is appreciated

Cons

- Lower response rate
- Higher probability of bias (e.g. only certain group answers); this issue was checked and found negligible for this research project (see section 7.2.4)
- No interaction and spontaneous answers

The reliability of the self-administered survey and the data quality of this research was improved by (Saunders et al., 2003; Shaffir & Stebbins, 1991):

- Well-arranged questionnaire design and clear questions
- Pilot testing of questionnaire
- Rejection of low quality responses
- Adding open questions and room for comments to allow for some qualitative information
- Use of micro cases for validation of data

A general limitation that every empirical research has to cope with is the honesty of the respondent. A friendly covering letter explaining the aims and benefits of the research, a reasonable questionnaire design with a limited number of clear questions that can be answered in the indicated time frame and incentives can promote honesty (Foddy, 1994; Saunders et al., 2003; SPSS, 2004).

At the end, the survey results are to be honestly and objectively assessed, evaluated and discussed by considering any limitations.

Designing the research process and assembling all necessary elements are one of the key tasks in preparing for a research project. The quality of the research design and process determines the quality of the outcome of the research.

6.4.5 Underlying assumptions for the research design and empirics

The following assumptions are made in the context of the research design and the empirical part of this research project. In addition, supporting arguments are provided where feasible.

- Selection of 31 management tools is a reliable framework for measuring knowledge and application of strategic management; management tools along the

phases of strategic management (section 2.7)

- Management tools addressed are recognised by respondents; common terms and denominations are used and no abbreviation is used without explanation (section 2.7, appendix A)
- Respondents use management tools in a correct way
- Defined key figures i.e. a) turnover per employee, b) return on sales, c) equity ratio, d) R & D ratio and e) continuous improvement rate are reliable measures for performance; a) measures efficiency, b) profitability, c) innovation, d) sustained performance, e) motivation (section 6.5.1)
- Data analysis based upon key figures for one year is acceptable; special effects such as write offs, windfall profit are considered (see section 7.4.3; Figure Apx. 7)
- The respondents understand the questions; clear questionnaire design and questions, pilot testing
- The majority of respondents can answer questions within 15 minutes; pilot testing
- The respondents answer in a truthful manner; use of a introductory letter, incentives
- Media type (posted versus web-based questionnaire) bias can be neglected; was assessed, see section 6.6.5
- Non-response bias can be neglected; was assessed, see section 7.2.4
- A selection of incentives improves return rate; return rate as expected
- SPSS 15 provides reliable data analyses; tested and used by the University of Glasgow
- A number 250 useable returns provides sufficient quality for data analysis and conclusions; calculations were carried out (see section 6.5.4.1)

The next section goes on to describe in detail the process and elements of the field work.

6.5 Preparing the fieldwork

Shaffir & Stebbins (1991, p. 1) describe fieldwork as “*inconvenient, to say at least, sometimes physically uncomfortable, frequently embarrassing and, to a degree always tense*”. In the history of fieldwork, anthropologists and sociologists were the main field researchers. However, in the last decade, field research significantly grew in disciplines such as economics and management. The goal of the field researcher is to collect valid and objective data to support his hypothesis or to explore new scientific areas.

In contrast to desk research, conducting field research (Shaffir & Stebbins, 1991):

- May require extensive financial funds
- May be very time consuming
- Needs extensive preparation to avoid failure, mistakes and to assure a high level of

quality

- Needs testing or piloting to allow fine tuning
- Provides a comprehensive inside view of the selected research sector
- Provides the up to date quantitative and qualitative data to answer specific research questions

6.5.1 Design and content of the questionnaire

The questionnaire is directly derived from the research questions. It is designed to meet the following requirements (MRS, 2003; Foddy, 1994; SPSS, 2004):

- Fit for the purpose of the research to generate data as close to reality as possible
- Appropriate coding to allow comprehensive statistical analysis of data via e.g. SPSS
- Appropriate to the sector and audience being researched
- Respondents can understand the questions and are able and willing to answer
- Respondent can decode the question in the intended way
- Questions do not lead the respondent to a certain answer
- Respondent is given the opportunity to decline an answer
- Manageable for the respondent in a reasonable period of time
- The answers shall be able to be interpreted in an unambiguous way
- The answers can be decoded in the way the respondent intended
- Compliance to ethical principles of the University of Glasgow, Faculty of Law, Business and Social Science

The questionnaire, listed in appendix A, is split into five sections:

1. Cover text
2. The executive; his position, management education and background
3. Strategic management, state and practice in the company
4. The company; general information and key performance indicators
5. Respondents and company's name; optional statements

Table 6.5 depicts the research question and their direct link to the survey questions.

Research questions	Survey question / relation (< >)	
1. What is the state of management education and, in particular, strategic management education of executives in the sector researched?	1.5	What is your professional education?
a) What strategic management knowledge was acquired in which area of education and via seminars or self-study?	1.6	What knowledge about the following general management and strategic management tools have you acquired during your education and is the respective tool applied in your company?
b) What is the relation of the type of education with the acquisition of strategic management knowledge?	-	1.5 < > 1.6
c) How do the responding executives rate the strategic management knowledge of their colleagues on the top executive level and the hierarchical level below?	1.10	Who else in your company has strategic management knowledge?
d) Are the responding executives satisfied with the general and strategic management education during undergraduate or graduate studies? If not, why?	1.7	Where you satisfied with the general management and strategic management education during your educational phases? If not why? 1.5 < > 1.7
e) How much time do executives spend on continuing education regarding general and strategic management and which medium is used to acquire knowledge?	1.8 1.9	How do you keep your general management and strategic management knowledge up to date? How many seminar or trainings days have you spent on general management and strategic management education in the last five years? 1.5 < > 1.8; 1.5 < > 1.9
2. What is the current practice in strategic management in the sector researched?	2.2 2.6 2.8 2.9	Who in your company is responsible for strategic management? Since when is your company doing strategic planning? How does your company deal with the key elements of strategic planning such as vision, objectives, strategy? How are strategic plans executed in your company?
a) What strategic management tools are applied in praxis?	1.6	What knowledge about the following general management and strategic management tools have you acquired during your education and is the respective tool applied in your company?
b) What is the relation of the type of education with the application of strategic management knowledge?	-	1.5 < > 1.6 1.5 < > 2.6
c) What is the approach to strategic management in responding companies?	2.3	How is strategic planning carried out in your company?
d) What are the motives and obstacles to strategic planning process?	2.5 2.4	Your company is doing strategic planning. What are the motives? In your company a strategic planning process is not installed. What are the reasons why?
e) What are the organisations and individuals doing to improve strategic management in their company?	2.7	What activities are planned to improve general / strategic management knowledge and practice in your company?
f) What is the perception or understanding of the executives regarding strategic management?	2.1	What is your perception of strategic management?
g) What kind of challenges do the executives see ahead and how do they cope with them?	3.13 3.14	What are the company's major challenges within the next two years? How will you meet these challenges?
3. What is the relation of education and strategic management practice with the performance outcome?	3.6 3.7 3.8 3.9 3.10 3.11	What was the turnover of your company in 2007? How many persons did your company employ in average in 2007? What was the return on sales in your company in 2007? What was the R & D ratio in your company in 2007? What was the equity ratio in 2007? How many suggestions have been made by employees of the company within the continuous improvement programme in 2007?
a) What is the relation of education with the performance outcome?	-	1.5 < > 3.6/3.7; 1.5 < > 3.8; 1.5 < > 3.9; 1.5 < > 3.10; 1.5 < > 3.11/3.7
b) What is the relation of continuing strategic management education with the performance outcome?	-	1.9 < > 3.6/3.7; 1.9 < > 3.8; 1.9 < > 3.9; 1.9 < > 3.10; 1.9 < > 3.11/3.7
c) What is the relation of strategic management practice with the performance outcome?	-	1.6 < > 3.6/3.7; 1.6 < > 3.8; 1.6 < > 3.9; 1.6 < > 3.10; 1.6 < > 3.11/3.7 2.6 < > 3.6/3.7; 2.6 < > 3.8; 2.6 < > 3.9; 2.6 < > 3.10; 2.6 < > 3.11/3.7 2.8 < > 3.6/3.7; 2.8 < > 3.8; 2.8 < > 3.9; 2.8 < > 3.10; 2.8 < > 3.11/3.7 2.9 < > 3.6/3.7; 2.9 < > 3.8; 2.9 < > 3.9; 2.9 < > 3.10; 2.9 < > 3.11/3.7
4. What is the relation of the managers' age with strategic management knowledge, practice, and performance outcome?	1.1	What is your age?
a) What is the relation of the managers' age with strategic management knowledge and practice?	-	1.1 < > 1.6
b) What is the relation of the managers' age with the performance outcomes of the company they lead?	-	1.1 < > 3.6/3.7; 1.1 < > 3.8; 1.1 < > 3.9; 1.1 < > 3.10; 1.1 < > 3.11/3.7
5. What is the relation of the managers' seniority with strategic management knowledge, practice, performance outcome, and education?	1.3 1.4	What is your position in your company? For how many years are you in that position?
a) What is the relation of the managers' seniority with strategic management knowledge and practice?	-	1.4 < > 1.6
b) What is the relation of the managers' seniority with the performance outcomes of the company they lead?	-	1.4 < > 3.6/3.7; 1.4 < > 3.8; 1.4 < > 3.9; 1.4 < > 3.10; 1.4 < > 3.11/3.7
c) What is the relation of the managers' seniority with their education?	-	1.4 < > 1.5
6. What is the relation of the company size with strategic management knowledge and practice?	3.7	How many persons did your company employ in average in 2007?
a) What is the relation of the company size with strategic management knowledge?	-	3.7 < > 1.6
b) What is the relation of the company size with strategic management practice?	-	3.7 < > 1.6; 3.7 < > 2.6

Table 6.5: Link of research questions with survey questions

Source: Developed by researcher

Based upon the common practice of performance measurement in the machinery and equipment sector (VDMA, 2005a), the following key performance indicators were selected for section four:

- Turnover per employee = total turnover / average number of employees; a commonly used financial key performance indicator, a measure for operations efficiency
- Return on sales = (profit or loss before tax / turnover) * 100; a commonly used

financial key performance indicator, reflecting the profitability in a certain year

- Equity ratio = (equity / total assets) * 100; an often used financial key performance indicator, a measure for the past medium and long-term success
- R&D ratio = (R&D expenditures / turnover) * 100; a frequently used operations key performance indicator, reflecting the potential of innovation and future success
- Continuous improvement rate = number of suggestions per year / average number of employees; frequently used operations performance indicator, a measure for employee motivation

Based upon the research questions and considerations of justification, the individual survey questions were developed, discussed, tested and fixed. In addition, the time to answer each question was evaluated to allow a calculation of the total time for filling out. The total time to fill out the questionnaire was calculated with about 15 minutes. In the course of the questionnaire design a coding plan was developed which facilitates the data entry and evaluation with SPSS 15.

6.5.2 Data sources for the survey

There are two basic options to get access to data sources that provide information about Mittelstand companies within the machinery and equipment sector selected for research:

1. Cooperation with a German association such as the VDMA or Mittelstandsvereinigung and utilisation of the membership database
2. Utilisation of databases services; there are several companies in Germany offering appropriate databases and datasets

6.5.2.1 Cooperation with the VDMA and use of membership database

The VDMA (Verband Deutscher Maschinen- und Anlagenbau e.V. = Association of German Machinery and Equipment Manufacturers) represents the German enterprises in the machinery and equipment sector worldwide. It was founded in 1890 and is headquartered in Frankfurt/Main. This organisation offers the largest network for the industry sector in Europe. Around 3,000 member companies (VDMA, 2008) with 20,000 specialists are registered (VDMA, 2006). The VDMA cooperates with the VDW (Verein Deutscher Werkzeugmaschinenfabriken e.V. = Association of German Machine Tool Manufacturers) founded in 189 which also has its headquarters in Frankfurt / Main. The VDW represents the sub-sector 29.4 manufacturers of machine tools in Germany and has about 110 member companies (VDW, 2006). Members of the VDW are automatically members of the VDMA.

Cooperation with the VDMA would bring the following benefits:

- Access and mailing of the questionnaires to approximately 2.400 enterprises of the research sector

- A higher response rate would be likely, if participation is recommended by the VDMA
- No cost for database services
- No costs for mailing, since it could be combined with a monthly standard mailing

On the other hand, cooperation with the VDMA would bring the following disadvantages:

- An estimated 50% of the total number of SMEs in the machinery and equipment sector are members of the VDMA. Therefore, the total number will not be reached in the selection process. Companies not doing so well may not be members of the VDMA (bias!).
- The VDMA classification of the machinery and equipment sector is not fully harmonized with the NACE 1.1 classification.
- VDMA may ask for changes, amendments of the questionnaire and raise other requirements.

Representatives of the VDMA were contacted via telephone at the end of 2005. Willingness for cooperation was signalled; however, conditions, such as approval of the questionnaire, were mentioned.

6.5.2.2 Cooperation with the Mittelstandsvereinigung and use of membership database

Another option is cooperation with the German Mittelstands- und Wirtschaftsvereinigung der CDU/CSU (SME and business association of the Christlich Demokratische Union = Christian Democratic Union and Christlich Soziale Union = Christian Social Union). This association has its headquarters in Berlin and has subsidiaries in all 16 federal states (Mittelstandsvereinigung, 2008). Unlike the VDMA, the Mittelstandsvereinigung is open to all German SMEs in all industry sectors, from restaurant owners to manufacturers of machinery and equipment.

The cooperation with the Mittelstandsvereinigung would bring the following benefits:

- There would be likely a higher response rate, if participation is recommended by the Mittelstandsvereinigung.
- No cost for database services
- No costs for mailing, since it could be combined with a monthly standard mailing

On the other side, the cooperation with the Mittelstandsvereinigung would bring the following disadvantages:

- The number of SMEs in the research sector which could be reached is unknown
- This association closely cooperates with the Christian Democratic Party. It is unlikely that executives close to the Social Democratic Party are members (bias!).
- Mittelstandsvereinigung may ask for changes, amendments of the questionnaire

and raise other requirements.

6.5.2.3 Database be-direct, Creditreform

The be-direct Verwaltungs-GmbH is a joint venture of AZ Direct and Creditreform. The latter is one of the leading institutions for credit ratings and information services on German SMEs. The database is structured according to the NACE classification. Via the be-direct internet site a request for quotation was issued. It covered SMEs in the research sector (NACE 29.1 to 29.5) with a number of employees ranging from 1 to 500 and the data fields give company name and address, branch, executives, legal form, number of employees, turnover and telephone. The quotation offered 8.484 data sets at a purchase price of € 4,921 (Creditreform, 2008).

The be-direct services as a data source would bring the following benefits:

- Direct access to the research sector without a third party; no compromises need to be made
- Total number of SMEs in the sector researched, 20 to 500 employees, NACE 29.1 – 29.5, can be reached

On the other side, the use of be-direct would bring the following disadvantages:

- There would probably be a lower response rate since no independent source recommends participation.
- Some data fields such as year of foundation and e-mail address were not quoted.
- High costs for database services and mailing

6.5.2.4 Database ProBusiness, databyte

Another data source considered is ProBusiness database by databyte GmbH in Luebeck, Germany. This company is among the leading providers of high quality information systems in Germany and it cooperates with partners such as Buergel and Schufa. The database “ProBusiness®” lists about 3 million German enterprises (databyte, 2006). About 5,900 enterprises are listed in section NACE 29.1 – 29.5 size range from 10 to 500 employees. The cost for the “ProBusiness®” database is € 499 plus a minimum of 2 to 3 updates of € 299 each for one year of subscription. This includes a data export option of 10,000 units.

The advantages and disadvantages are similar to the database be-direct described above.

6.5.2.5 Hoppenstedt database

Hoppenstedt database services provide another option to access the required data of SMEs in the research sector. Hoppenstedt Firmeninformationen GmbH in Darmstadt, Germany, is a leading company for database services. Data records about companies, consumer groups, etc. can be selected and purchased. The services are mainly requested for

marketing purposes.

Hoppenstedt is part of the Swedish Bonnier Group (turnover approximately € 1.9 billion in 2003), one of the largest media companies in Europe. Its database includes over 225,000 profiles of German companies, banks, their branches and the major industrial associations in Germany. More than 700,000 decision makers in top and middle management are listed (Hoppenstedt, 2006). According to Hoppenstedt (2005) the database “German Top Business Addresses” lists a total number 19,700 enterprises (all size categories) in section NACE 29. All company data sets are at least updated once per year.

Hoppenstedt was contacted in early May 2008 regarding a dataset for SMEs in the machinery and equipment sector NACE 29.11 to 29.56. A quotation for a dataset was provided for about 6,000 companies with about 9,800 top executives at a price of € 11,114 (Hoppenstedt, 2008)

Hoppenstedt, as a data source, would bring advantages and disadvantages which are similar to the database be-direct described above. However, the Hoppenstedt dataset provides additional data regarding year of foundation, return on sales, investment ratio and equity ratio.

6.5.2.6 Further databases considered

In addition to the databases described above, the following data sources were considered:

- Bundesfirmenregister (2008), database
- Cebus (2008), database services
- DataM-Services (2008), database services
- Deutsche Post (2008), database services
- Deutschland B2B (2008), database services
- GBI Genios (2007), German business information
- Kreuzer (2008), direct marketing
- Quadress (2008), direct marketing
- Schober (2008), information services
- Stettin Direct Marketing (2006), flat rate database
- IHKs, membership directories

6.5.2.7 Selection of database

For the determination of the most appropriate option, the individual databases available for research were assessed in a value analysis. Table 6.5 depicts the value analysis matrix.

On the top line, the different data sources are listed. In the left column the parameters to be considered in the value analysis are indicated and weighted in the column next to the right.

Completeness of the research population and access to the database without any compromises are given the highest weight. The rating of the parameter is granted according to the researcher's perception and the value is calculated for each option.

Data source →		VDMA		Mittelstands-Vereinigung		be-direct, Creditreform		Pro-Business		Hoppenstedt		Deutsche Post		Deutschland B2B, Cebus, Genios		Kreuzer, Quadress, Schober, DataM		Stettin		HK	
Rating / value → Parameter ↓	W	R	V	R	V	R	V	R	V	R	V	R	V	R	V	R	V	R	V	R	V
Completeness of research population	0.25	2	0.50	1	0.25	9	2.25	10	2.50	10	2.50	9	2.25	9	2.25	9	2.25		0.00	9	2.25
Access to database; no compromise	0.20	4	0.80	3	0.60	10	2.00	10	2.00	10	2.00	10	2.00	10	2.00	10	2.00	10	2.00	5	1.00
Completeness of data fields	0.15	7	1.05	6	0.90	5	0.75	5	0.75	10	1.50	5	0.75	5	0.75	5	0.75	5	0.75	5	0.75
Quality of data	0.10	10	1.00	10	1.00	8	0.80	8	0.80	9	0.90	8	0.80	8	0.80	8	0.80	8	0.80	10	1.00
Impact on response rate	0.10	10	1.00	2	0.20	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00		0.00
NACE classification	0.05	2	0.10	2	0.10	10	0.50	10	0.50	10	0.50	7	0.35	5	0.25	5	0.25	5	0.25	2	0.10
Data fields include key performance indicators	0.05	0	0.00	0	0.00	0	0.00	0	0.00	8	0.40	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Time consumption	0.05	8	0.40	8	0.40	10	0.50	10	0.50	10	0.50	10	0.50	10	0.50	10	0.50	10	0.50	0	0.00
Cost	0.05	10	0.50	10	0.50	1	0.05	2	0.10	5	0.25	5	0.25	5	0.25	5	0.25	5	0.25	10	0.50
Total	1.00		5.35		3.95		6.85		7.15		8.55		6.90		6.80		6.80		4.55		5.60
Ranking			7		9		4		2		1		3		5		5		8		6

Legend: W = Weight, R = Rating from 1 to 10; V = Value ($V = W * R$)

Table 6.6: Value analysis for data source selection

Source: Developed by researcher

According to the value analysis, the Hoppenstedt database is the most appropriate as this option receives 8.55 of 10.0 possible points.

Hoppenstedt was contacted again at the end of May 2008 and asked to support the research by granting a discount on the required data set. They supported the research project by providing the dataset for € 1,190 (about 90% discount) (Hoppenstedt, 2008a).

6.5.3 Hoppenstedt data set

The Hoppenstedt data set with 5,955 SMEs in the machinery and equipment sector were delivered on a CD ROM in MS Excel format. The following data fields are included (Hoppenstedt, 2008b):

- NACE classification
- Name of the company
- Street name
- City
- Postal code
- Fax number
- Phone number

- E-mail address
- Internet address
- Year founded
- Number of employees
- Turnover
- Return on sales
- Investment ratio
- Equity ratio
- Name of the executives
- Function / title

From this data set, information such as gender, sales per employee and average age of the companies can be derived for the entire research population.

6.5.4 Sampling procedures

Sampling methods are part of the statistical procedures. The term “statistics” is derived from the Latin word “status”, meaning state, condition (Meyers, 1990). One of the founder of statistical methods was Carl Friedrich Gauss, (1777 – 1855) a professor for mathematics and astronomy at the University of Goettingen, Germany. In his publication, “Disquisitiones Arithmeticae” he set the basis for modern theory of numbers. In Germany, the term standard distribution is also called the “Gauss’sche Normalverteilung” (Meyers, 1990). Schaich (2005, p. 2776) describes statistics as a “*comprehensive quantitative methodological instrument for characterising and evaluating empirical results of homogeneous units (mass phenomenon)*”. Statistical methods, or analyses, are geared to explore or describe characteristics of a population by using a sample. From the results of the sample, conclusions can be drawn for the total population (induction). The major premise in sampling is that every unit of this population has the same probability to be selected (random selection). Descriptive statistics enable the description and the comparison of categorical or numerical variables from the survey numerically (Saunders et al., 2003).

6.5.4.1 Expected response rate and net sample size

In order to get a rough assessment of the possible return rate, the researcher contacted a VDMA executive, in charge of member surveys (Friedrich, 2008). Based upon experience of surveys involving top executives in the machinery and equipment sector, the VDMA representative estimated the response rate between 5 and 8 %. Asked for the reason for this low response rate, he cited time constraint and general antipathy against surveys. Top executives are less inclined to fill out questionnaires. Friedrich (2008) also mentioned that posted questionnaires tend to have a higher response rate. This confirms findings made by

Saunders et al. (2003) that response rates via internet are usually lower than those via post. In light of the low expected response rate, the researcher decided to approach the whole population: 40% via posted questionnaire and 60% via internet based questionnaire. The latter was feasible since the Hoppenstedt database includes the e-mail address of the companies

The questionnaire provides an assortment of categorical / qualitative and numerical data. Basically for every question, a net sample size, the number of usable responses, could be calculated with different methods, but this would be exaggerated. In the following, different approaches to determine a sample size and examples with questions from this research project are introduced.

According to Masser (2003), the sample size for the continuous variables from the questions 3.8 - 3.10 (see questionnaire in the appendix) “performance indicators” can be derived as follows (sample size for representative public surveys):

$$n = (\alpha / e)^2 * \delta^2$$

$$n = (1.96 / 0.05)^2 * 1.2$$

$$\underline{n = 1844}$$

n = net sample size

α (or z) = critical value; 1,96 at 95% confidence level, common for surveys (Moore, 2004)

e = error margin; 5%, for surveys

δ^2 = variance (square of standard deviation); estimated at 1,2 (Masser, 2008)

The determination of the sample size for the nominal variable from question 1.2 “gender of the respondent” is as follows (Saunders et al., 2003):

$$n = p * q * (z / e)^2$$

$$n = 10 * 90 * (1.96 / 5)^2$$

$$\underline{n = 138}$$

n = net sample size

p = proportion belonging to the specific category; 10% female

q = proportion not belonging to the specific category; 90% male

z = critical value; 1,96 at 95% confidence level, common for surveys (Moore, 2004)

e = error margin; 5%, for surveys

The determination of the sample size for the nominal variables from question 1.5 “engineering education or not” is as follows (Saunders et al., 2003):

$$n = p * q * (z / e)^2$$

$$n = 60 * 40 * (1.96 / 5)^2$$

$$\underline{n = 369}$$

n = net sample size

p = proportion belonging to the specific category; 60% of top executives are engineers

q = proportion not belonging to the specific category; 40% of top executives are not engineers

z = critical value; 1,96 at 95% confidence level, common for surveys (Moore, 2004)

e = error margin; 5%, for surveys

The determination of the sample size for the continuous variables from question 3.3 “year of foundation” is as follows (Derflinger et al., 2003):

$$n = z^2 * \sigma^2 / e^2$$

$$n = 1.96^2 * 37^2 / 5^2$$

$$\underline{n = 210}$$

n = net sample size

z = critical value; 1,96 at 95% confidence level, common for surveys (Moore, 2004)

σ = standard deviation; 37 years, calculated based upon a existing database of 5,850 SMEs sector machinery and equipment (databyte, 2004)

e = error margin; 5%, for surveys

Saunders et al. (2003) provide a list indicating the number of units in the total population and the sample size for different error margins. For a population of 5,000 and an error margin of 5% the sample size is 357. For a population of 10,000 and an error margin of 5% the sample size is 370. For the population of the research sector of 5,955 the sample size derived by interpolation is n = 359.

The samples sizes calculated with different approaches ranges from 138 to 1,844. The latter is for representative public surveys and not further considered. From the remaining examples ranging from 138 to 369 a “reasonable” minimum net sample size of 250 useable responses is determined. By “reasonable”, a balance of good quality and bearable costs is considered.

6.5.4.2 Data collection and sampling procedure

The Hoppenstedt data set is provided in a MS Excel file. To avoid any clustering, the records are numerically sorted by postal code. On the left side a column is inserted and each company receives a consecutive number from 1 to 5,955 (see Table 6.6). From the total number of 5,955 companies, a random selection of 2,400 enterprises was taken subject to receiving the postal questionnaire. The sample was chosen in a way that every data set had the same chance to be selected (Moore, 2004). For that purpose, a random integer generator was used. The integer generator provided random numbers for the given population. Each number was picked independently from the others (Haahr, 1999). The random integers from the given population of 5,955 were generated with the Microsoft Excel programme via the formula “=ZUFALLSZAHN()*5955” (random integer). Duplicates were replaced by newly generated random integers.

The random integers were matched with the sequence number in the first column “No” of the Hoppenstedt database with the number 1 in column “Survey” (Table 6.7).

No	Survey	Company 1	Street	City	P-Code
1	2	Kühlanlagenbau Süd-Ost GmbH	Werdauer Str. 1-3	Dresden	01069
2	1	Applied Materials GmbH	Buchenstr. 16 b	Dresden	01099
3	2	ASEM Präzisions-Automaten-GmbH	Manfred-von-Ardenne-Ring 13	Dresden	01109
4	2	Pharmatec GmbH	Manfred-von-Ardenne-Ring 5	Dresden	01127
5	1	EHT Maschinensysteme GmbH & Co	Am Promigberg 20	Dresden	01129
6	2	WaCo Gerätetechnik GmbH	Am Promigberg 4	Dresden	01157
7	2	Entegris GmbH	Hugo-Junkers-Ring 5	Dresden	01157
8	2	Leybold Optics Dresden GmbH	Zur Wetterwarte 50	Dresden	01159
9	1	Oerlikon Leybold Vacuum	Zur Wetterwarte 50	Dresden	01189

Table 6.7: Database excerpt (research population)

Source: Hoppenstedt (2008b)

Companies who received an e-mail (3,555) with the invitation to participate in the survey via internet based questionnaire were coded in the column “Survey” with the number 2.

With the MS Excel filter function and the MS Word serial letter tool, personalised covering letters were printed and the distribution list for e-mail invitations was generated.

Questionnaires sent by post were placed with the personalised covering letter in a window envelope 32.5cm by 22.8 cm. Enclosed was an addressed envelope of the same size to return the completed questionnaire. On the return envelope, the note “postage paid by receiver” was printed.

6.5.5 Ethical approval of the field research

The fieldwork approach including covering letter, e-mail and questionnaire were submitted to the Chair of Departmental Ethical Research Committee, University of Glasgow, Department of Business and Management for ethical approval. Ethical approval was granted on July 28, 2008.

6.5.6 Piloting and improvement of fieldwork approach

After ethical approval was received, the fieldwork approach including covering letter and questionnaire were presented to two business colleagues in managing positions. They were kindly asked to check thoroughly the fieldwork approach and documents and to provide feedback. Their comments and recommendations were considered on the fieldwork approach, as well as on pertinent documents.

In addition, a pilot test mailing was carried out. The purpose was to check out the following (Saunders et al., 2003; SPSS, 2004):

- Is the fieldwork approach appropriate?
- Is the covering letter appropriate and inviting?
- Are the incentives promised appropriate and motivating to filled out and return the questionnaire?
- Is the layout user friendly and attractive?
- Are the instructions given clearly?

- Are the questions clear, understandable and unambiguous?
- Are important topics or questions missing?
- Any other comments or suggestions on the documents and fieldwork approach?

For the pilot test mailing, 50 companies were randomly selected from the population. The questionnaires were mailed on August 23, 2008. Two executives who responded, were contacted for feedback regarding the questionnaire and covering letter. One executive recommended including a guideline “strategic planning and management tools” as an additional incentive. This recommendation was added in the serial letters and mails following the pilot. Both executives confirmed that the questions were understandable and that the questionnaire could be finished in about 15 minutes.

6.5.7 Text for covering letters and e-mails

All survey questionnaires sent out to the enterprises were accompanied by a personalised covering letter or e-mail. This letter or e-mail is the first item the prospective respondent sees. It briefly describes the research project, provides basic instructions, invites and motivates to fill out and return the questionnaire (Saunders et al., 2003). The covering letter or e-mail is filed in appendix A.

6.5.8 Incentives for completing the questionnaire

Any empirical research in social science depends upon those who are asked to participate and their cooperation and willingness to accept an interview or fill out and return a questionnaire. Every effort should be put into the design of the field research documents such as questionnaire, cover letter and e-mails, to make it easy to respond and difficult to refuse. One way to increase the return rate is to offer incentives to those asked to fill out and return the questionnaire (SPSS, 2004). For this research project, the following incentives were offered (Table 6.8):

	Bottle of wine	Book "Unternehmens-fuehrung"	UoG pen	Executive summary research findings	Guideline strategic planning
Contributors e.g. literature				X	X
Business partners providing feedback on field research documentation	X	X	X	X	
All receivers of questionnaires via mail			X		
Respondents of questionnaire	every 20th			X	X

Table 6.8: Incentives for contributors and persons participating

Source: Developed by researcher

A ball pen with the University of Glasgow logo (Figure 6.11) was enclosed with all posted questionnaires. This was intended to motivate the recipient completing the questionnaire with the pen and then return the questionnaire.



Figure 6.11: Ball pen with UoG logo

Source: Developed by researcher

As an additional incentive, every twentieth respondent received a bottle of Franconian wine in a gift box (Figure 6.12). The returned questionnaires received a consecutive number in the SPSS database. Number 20, 40, etc. received the bottle of wine. If a winning number did not have a postal address, the next questionnaire returned in sequence with an address won.



Figure 6.12: Bottle of Franconian wine and gift box

Source: Developed by researcher

6.5.9 The web-based questionnaire

With the introduction of internet services, web-based surveys with questionnaires became popular. Service providers such as Survey Monkey or 2ask offer web-based surveys with self-administered questionnaires at reasonable cost (Survey Monkey, 2008; 2ask, 2008). Respondents, who are used to e-mail and the internet prefer to answer questionnaires via the internet. In addition, serial e-mails to potential respondents are very efficient, since no costs for postage, copies and envelopes are induced.

For the web-based questionnaire of this research project, a special internet site was created


with the URL “<http://www.university-of-glasgow-survey.de>”. This internet site was active from August 1, 2008 until January 30, 2009.

The questionnaire was programmed on this internet site by a free lance employee of the Wagner Consulting GmbH. Before the web-survey was started, comprehensive tests were carried out in order to assure its quality and reliability.

Anonymous responses to the web-based survey are not traceable to the person or company responding to assure confidentiality.

Figure 6.13 depicts the first page of the web-based questionnaire and Figure 6.14 an example of a response.

Forschungsprojekt:
Der Einfluss der Managementausbildung auf strategische Praxis und Erfolg am Beispiel der KMUs im deutschen Maschinen- und Anlagenbau.


Faculty of Law, Business and Social Science

Fragebogen für das Forschungsprojekt

"Der Einfluß der Managementausbildung auf strategische Praxis und Erfolg am Beispiel der KMUs im deutschen Maschinen- und Anlagenbau"

Das oben genannte Forschungsprojekt, das im Rahmen einer Dissertation durchgeführt wird, soll den derzeitigen Stand und Umfang der Managementausbildung und dessen Einfluss auf die Praxis des strategischen Managements sowie den Unternehmenserfolg in ihrer Branche beleuchten. Ziel ist es, mit den Forschungsergebnissen einen Beitrag zur Weiterentwicklung der Managementausbildung zu leisten, ein Best Practice Modell zu identifizieren und insbesondere KMUs bei der Umsetzung ihrer strategischen Vorhaben zu unterstützen.

Im Hinblick auf den strategischen Fokus ist es wichtig, dass die Fragen zum Forschungsvorhaben an Führungskräfte der oberen Hierarchieebene von Unternehmen des **Maschinen- und Anlagenbaus** adressiert werden.

Falls Sie Fragen haben wenden Sie sich bitte an:

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Am See 7
97456 Dittelbrunn-Hambach
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Faculty of Law, Business and Social Sciences; Department of Management; West Quadrangle; Gilbert Scott Building; Glasgow G12 8QQ; Scotland; <http://www.gla.ac.uk/>

Datenschutzerklärung

Alle erhaltenen Daten werden mit strikter Vertraulichkeit gemäß den Datenschutzrichtlinien des "Ethical Research" der University of Glasgow behandelt:
<http://www.gla.ac.uk/faculties/bss/research/ethics/>

Für diese Befragung wird die Datenbank der Firma Hoppenstedt Firmeninformationen GmbH, Darmstadt, eingesetzt.

Befragung starten

Falls Sie es vorziehen einen Ausdruck zu bearbeiten, können Sie den Fragebogen auch herunterladen, ausdrucken, ausfüllen und zuschicken. [Das Portal übernehmen wir.](#)

Fragebogen herunterladen (60 KB)

Figure 6.13: Web-based questionnaire
Source: Developed by researcher

Online-Umfrage UoG; Management Education / Strategic Practice and Performance

File Bearbeiten Ansicht Extras Nachricht ?

Antworten Allen antw... Weiterleiten Drucken Löschen Zurück Weiter Adressen

Von: Unbekannter Absender
Datum: Dienstag, 9. Dezember 2008 11:31
An: rwaco@it-online.de
Betreff: Online-Umfrage UoG; Management Education / Strategic Practice and Performance

Tue, 9 Dec 2008 11:31:33 +0100

1.01: 45

1.02: Herr

1.03a: Gesellschafter und Geschäftsführer

1.03b:

1.04: 6

1.05.A.b:

1.05.B: Dipl.-Ing.

1.05.B.b:

1.05.C.b:

1.06.01_Benchmarking: [Firma_nein, Seminar,]

1.06.02_SWOT: [Abschnitt_B, Firma_ja, Selbststudium, Seminar,]

1.06.03_Porter: [Firma_nein, Unbekannt,]

1.06.04_Szenarietechnik: [Firma_ja, Selbststudium,]

1.06.05_Vision: [Firma_ja, Selbststudium,]

Figure 6.14: Example of response via web-based questionnaire

Source: Developed by researcher

6.5.10 Data collection budget

For the data collection, the researcher has provided the following budget which was almost exhausted (Table 6.9). The highest cost was for postage, followed by that for photocopying and then for the Hoppenstedt database.

Item	EUR	Share in %
Hoppenstedt database	1,190.00	12.4%
Envelopes	400.00	4.2%
Labels	35.00	0.4%
Photo copies 30,000 pcs	1,500.00	15.6%
Postage	4,500.00	46.7%
Salaries for filling envelopes	100.00	1.0%
Programming web-based survey	250.00	2.6%
Serial e-mail service	80.00	0.8%
Ball pens 2,700 pcs	975.00	10.1%
Wine, 30 bottles, including box	300.00	3.1%
Books "Management Tools" 20 pieces	300.00	3.1%
Total	9,630.00	100.0%

Table 6.9: Budget for field research

Source: Developed by researcher

The next section reports the actual field work, data handling and management activities.

6.6 Conducting the fieldwork

After the ethical approval was granted by the University of Glasgow, the Hoppenstedt database, as well as office supplies, were purchased. In addition, the programming of the web-based survey was begun. The final preparations were carried out and the data collection was started on August 19, 2008.

6.6.1 Questionnaire mailing activities

Figure 6.15 depicts the questionnaire mailing activities and questionnaires received during the time line. This was started on August 19, 2008 and completed on January 16, 2009. In total 2,450 questionnaires (41% of total population) were sent via post in two batches of 1,200 each on September 15, and November 10, 2008. (50 questionnaires for the pilot were mailed on August 23, 2008). The invitations via e-mail to participate in the survey were sent in three batches of about 1,160 each (59% of total population) on September 22, October 13 and December 3, 2008.

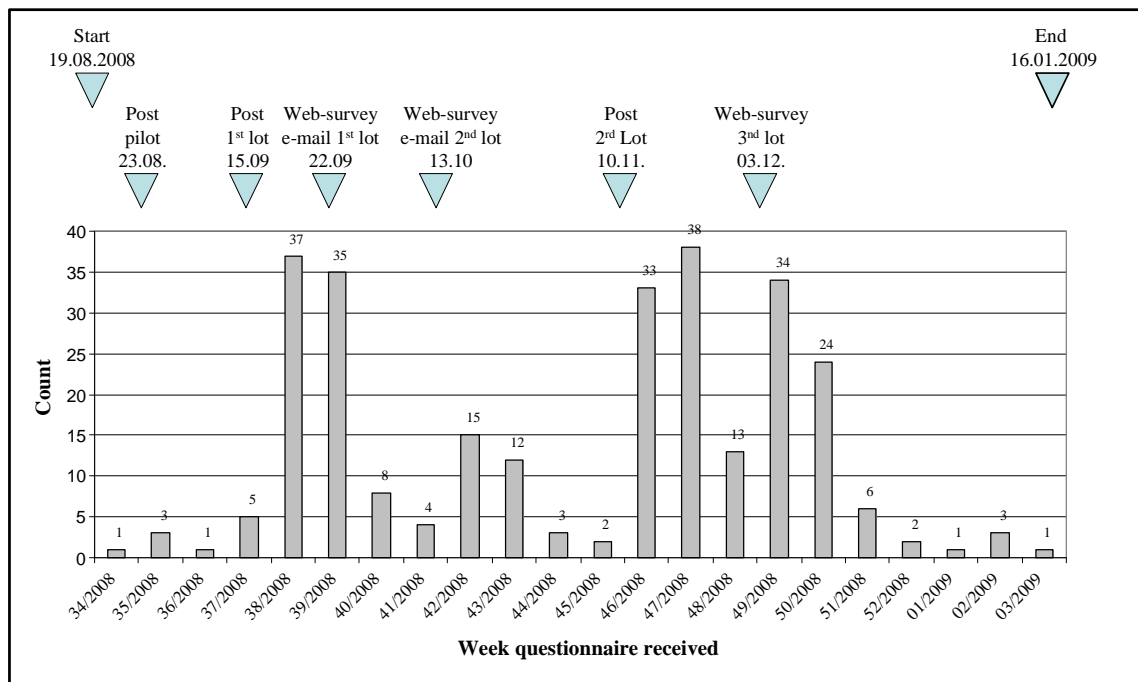


Figure 6.15: Mailing activities and questionnaires received

Source: Developed by researcher

6.6.2 Data management procedure

Saunders et al. (2003) suggest installing data management procedures to keep track of questionnaires mailed and received and the following procedure was applied, Figure 6.16.

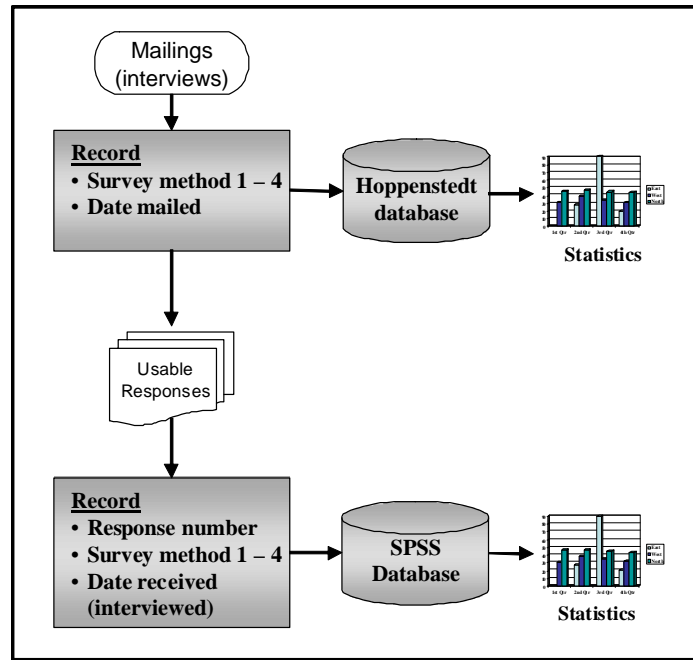


Figure 6.16: Data management procedure

Source: Developed by researcher

The codes for the survey method used are:

- Number 1: Mailing via post
- Number 2: Web-based questionnaire
- Number 3: Telephone interview
- Number 4: Personal interview

Mailings sent, or interviews carried out, were recorded in the Hoppenstedt database by entering the survey method 1 to 4 and the date. Usable responses received were stamped with the current date and filed in binders by consecutive numbers. In the SPSS database, the consecutive response number, data collection method 1 to 4 and the date received were entered. The SPSS case number was entered into the Hoppenstedt database. Table 6.10 depicts the data management activities in the Hoppenstedt database.

Company No	Code	Date mailed	Date received, comment	Case study yes, no, maybe	SPSS case number
37	1	15.09.2008			
38	2	22.09.2008			
39	2	03.12.2008			
40	2	22.09.2008			
41	1	15.09.2008	Rejected		
42	1	10.11.2008			
43	2	13.10.2008			
44	2	22.09.2008			
45	2	03.12.2008			
46	2	22.09.2008			
47	1	10.11.2008	14.11.2008	No	16

Table 6.10: Database excerpt

Source: Developed by researcher

A questionnaire was considered as non-usable if:

- More than three questions were not answered
- If more than three questions were answered wrongly

Some missing data (turnover, employees, year founded) was taken from the Hoppenstedt database.

6.6.3 Other data collection activities

The following organisations were asked for support by informing and encouraging their members to participate in the research survey:

- DGQ, Deutsche Gesellschaft fuer Qualitaet (German Society for Quality)
- DIHK, Deutsche Industrie und Handelskammer (German Chamber of Industry and Commerce); (umbrella organisation for all local IHK offices in Germany)
- Mittelstands- und Wirtschaftsvereinigung der CDU/CSU (SME and business association)
- VDI, Verein Deutscher Ingenieure (Association of German Engineers)
- VDMA, Verband Deutscher Maschinen- und Anlagenbau e.V. (Association of German Machinery and Equipment Manufacturers)

The DGQ was kindly willing to inform their members about the research programme and encouraged them to participate. The link to the web-based questionnaire was published on the DGQ newsletter number 11/2008 issued on December 11, 2008 the URL: http://www.dgq.de:80/wui/wui-aktuelles_7097.htm.

The VDMA kindly handed out some questionnaires to top executives in the machinery and equipment sector participating in VDMA seminars or meetings.

The other organisations listed above rejected the request, stating that too many requests for survey support are received and in general no support can be provided to any individual or to any institution.

6.6.4 Response rates

In total, 290 responses were received until the end of the data collection period. The number of useable returns is 281 (96.9%) and the number of non-useable returns is 9 (3.1%). The 9 responses (2 via post = 0.7%, 7 via web-based survey = 2.4%) had to be rejected, since several key questions were not answered at all.

On 188 completed questionnaires (66.9%), the executive was identified. For three returns the e-mail address only was provided. On 185 returned questionnaires, the company was identified. The remaining 93 responses (33.1%) were sent anonymously.

The count of responses via postal mail is 168 (59.8%) while 106 (37.7%) completed questionnaires came via the web-based survey (Figure 6.17). Personal and telephone interviews, as well as e-mail returns, played a minor role in the data collection.

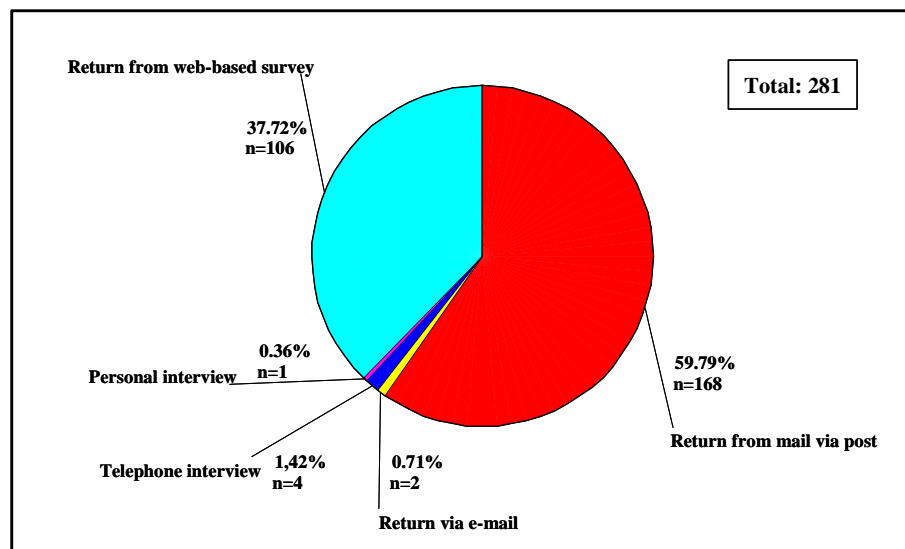


Figure 6.17: Type of response
Source: Developed by researcher

The overall response rate (useable returns 281; total population 5,955) is 4.7%. For posted questionnaires, the return rate was 6.9% and for the web-based questionnaire 3.0%. The return rate was as estimated. The response rate on the web-based survey was less than that of the postal questionnaire. It is likely that the main reasons for this are the spam filter some companies apply for e-mails from unknown sources and secretaries who usually check and filter incoming e-mails for the executive.

39 companies responded via letter, mail, or telephone and stated their reason for not participating in the survey. Figure 6.18 lists these reasons. General objections and denial to answer questionnaires of any type and any source were stated by 24 companies (61.5%) followed by time constraints (8 companies, 20.5%). Some companies stated that they are not involved in strategic management and one executive had difficulties in understanding the questions.

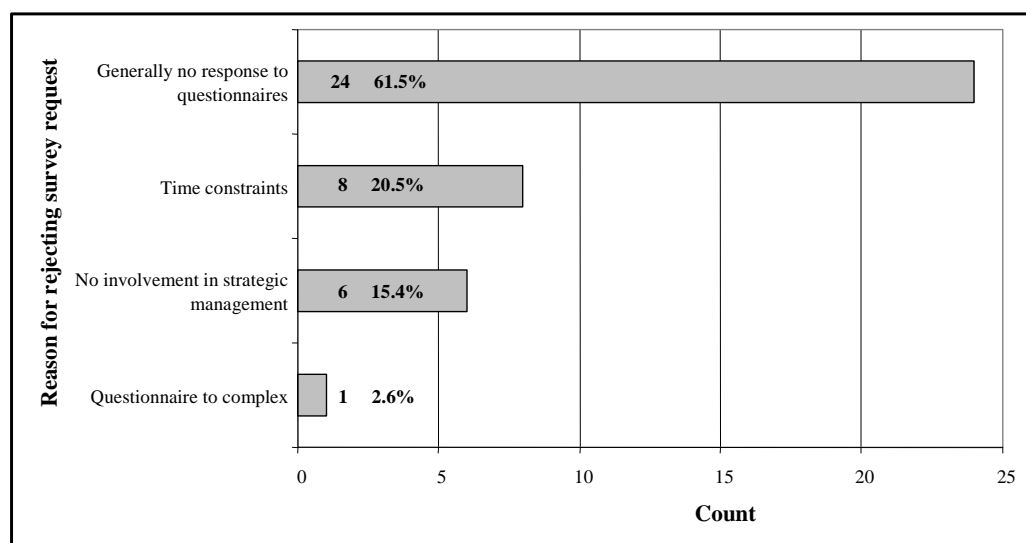


Figure 6.18: Reasons for rejecting the survey request
Source: Developed by researcher

One executive, an engineer with a doctoral degree, stated in his friendly letter: “If we were to answer all requests to fill out questionnaires or to provide information or statistics, we would have to hire an additional expert”. Another executive stated in a telephone call: “If I were to answer all questionnaires I receive, I would have to work one hour longer per day”. There is indeed an explosion of questionnaire and survey requests from universities, institutions, associations, consulting companies, etc. addressed to companies and executives. During the period of data collection from August 19, 2008 through January 16, 2009 the researcher received, as a president of a consulting company, five requests to fill out questionnaires via the internet from universities, business schools, or associations.

The fact that the survey request came from an university outside Germany did not matter at all. None of the respondents, or those who rejected the survey request, or executives interviewed by telephone questioned this.

6.6.5 Assessment of bias on type of return

One could argue that there is a difference between executives or companies responding via post and those via web-based questionnaire. The researcher has evaluated a possible bias by testing the relation of the response type post and web-based with four dependent variables with the aid of the SPSS “compare means” modelling and the ANOVA table. No significant relation was detected:

- Age of the respondent: Average 48.81 years, post 49.19 years, web-based 48.18 years, Sig. 0.400
- Turnover of the company: Average € 20.72 million, post € 20.71 million, web-based € 20.74 million, Sig. 0.994
- Knowledge of SM tools: Average 17.2 tools, post 17.21 tools, web-based 17.19 tools, Sig. 0.988
- Application of SM tools: Average 10.85 tools, post 10.80 tools, web-based 10.92 tools, Sig. 0.891

6.6.6 Survey correspondence

To all respondents who identified themselves, an e-mail or letter was sent confirming the receipt of the completed questionnaire and thanking them for their participation. This survey correspondence was filed behind the questionnaires received. Other survey correspondence, such as letters or mails from executives declining the survey request, letters to and from associations and interview reports were filed in separate binders.

6.6.7 Lessons learned

The high quality of the Hoppenstedt database was very helpful. Not one address of 2,450 companies who received the questionnaire via post turned out to be wrong and the

managing director had changed in only in two cases. In addition, missing data such as the number of employees, the year the company was founded and turnover could be accessed.

A researcher surveying at the top management level in Germany must be prepared to accept low response rates.

The “old fashioned”, but much more expensive mailing of questionnaires by post turned out to generate a much higher return rate. An executive receiving a personalised letter with a small gift, such as a pen, is more inclined to fill out and return the questionnaire. The potential respondent can quickly glance through the questionnaire and decide to answer. To glance through web-based questionnaires is possible, but more time consuming. Respondents start the questionnaire and later give up or do not answer the questions in full. The higher rate of non-useable returns via web-based survey (2.4% versus 0.7% for postal survey) seems to reflect this.

The incentives were appreciated by the respondents as letters, e-mails and telephone calls proved.

6.7 Summary

Clear research objectives and question are the driving force of the research design and process and the basis for the outcome and results of the research project (Saunders et al., 2003). Knowledge of the philosophies (Easterby-Smith et al., 2002) and elements of social research is also an important prerequisite for defining the research. Over time, a wide variety of social research approaches, strategies and methods were developed. A key issue is the decision regarding the methodology, namely qualitative or quantitative research or a combination of it (Shaffir & Stebbins, 1991; Cook & Campbell, 1979). The researcher has to define which best fits his research project. Limitation of the research endeavour must be considered and where possible mitigated (Remenyi, et al. 1998). Preparing the fieldwork includes organisational and tactical tasks to be carefully planned and carried out before the fieldwork is started (Shaffir & Stebbins, 1991). The management of responses in the respective database is important to assure data quality and security. Finally, the effort to find the financial funding required and the time needed is high.

Table 6.11 lists all the final research questions and their link to the literature in previous chapters in addition to the link to the research design which was derived and applied.

Link to literature review	Research question	Link to research design
1.6 Management education and the engineer's dilemma 3.7 The ME in Germany 5.4 Management education in Germany	1. What is the state of management education and, in particular, strategic management education of executives in the sector researched?	Quantitative and qualitative data > survey micro case study
1.2 Strategic management; a brief introduction 2.7 Strategic management tools 5.4 Management education in Germany	a) What strategic management knowledge was acquired in which area of education and via seminars or self-study?	Descriptive statistics, tables and graphs
1.6 Management education and the engineer's dilemma 3.7.6 The role of the engineer in the ME 5.4 Management education in Germany	b) What is the relation of the type of education with the acquisition of strategic management knowledge?	Cross tabulation and pearson chi-square test Compare means modelling and ANOVA
1.2 Strategic management; a brief introduction 2.7 Strategic management tools 5.4. Management education in Germany	c) How do the responding executives rate the strategic management knowledge of their colleagues on the top executive level and the hierarchical level below?	Descriptive statistics, tables and graphs
5.4 Management education in Germany 5.5 Pedagogy of management education	d) Are the responding executives satisfied with the general and strategic management education during undergraduate or graduate studies? If not, why?	Descriptive statistics, tables and graphs
5.4.3 Postgraduate management education 5.4.4 Informal learning 5.4.5 Lifelong learning	e) How much time do executives spend on continuing education regarding general and strategic management and which medium is used to acquire knowledge?	Descriptive statistics, tables and graphs Compare means modelling and ANOVA
3.7 The ME in Germany 4. Previously published research results regarding SME 5.6.2 SM and absorptive capacity 5.6.3 Barriers to SM	2. What is the current practice in strategic management in the sector researched?	Quantitative and qualitative data > survey micro case study
2.7 Strategic management tools	a) What strategic management tools are applied in praxis?	Descriptive statistics, tables and graphs
1.6 Management education and the engineer's dilemma 3.7.6 The role of the engineer in the ME	b) What is the relation of the type of education with the application of strategic management knowledge?	Cross tabulation and pearson chi-square test Compare means modelling and ANOVA
3. The SME community and research sector 4. Previously published research results regarding SME	c) What is the approach to strategic management in responding companies?	Descriptive statistics, tables and graphs
2.4 Strategic planning 2.6 Strategic management models 5.6.3 Barriers to SM	d) What are the motives and obstacles to strategic planning process?	Descriptive statistics, tables and graphs
4. Previously published research results regarding SME 5.6.2 SM and absorptive capacity	e) What are the organisations and individuals doing to improve strategic management in their company?	Descriptive statistics, tables and graphs
2.3 What is SM 2.6 Strategic management models	f) What is the perception or understanding of the executives regarding strategic management?	Qualitative data > micro case studies > additional use of secondary data and observation
3.7.4&5 Challenges to ME	g) What kind of challenges do the executives see ahead and how do they cope with them?	Qualitative data > micro case studies > additional use of secondary data and observation
4. Previously published research results regarding SME 5.6 SM practice, management education & performance	3. What is the relation of education and strategic management practice with the performance outcome?	Hypothesis testing of data from research questions 1 & 2
5.4 Management education in Germany 5.6.5 The impact of mgmt. education upon performance	a) What is the relation of education with the performance outcome?	Compare means modelling and ANOVA
5.6.5 The impact of mgmt. education upon performance	b) What is the relation of continuing strategic management education with the performance outcome?	Linear regression and ANOVA
4. Previously published research results regarding SME 5.6.4 The impact of SM practice upon performance	c) What is the relation of strategic management practice with the performance outcome?	Linear regression and ANOVA
4. Previously published research results regarding SME 5.6 SM practice, management education & performance	4. What is the relation of the managers' age with strategic management knowledge, practice, and performance outcome?	Hypothesis testing of data from research questions 1 & 2
2.7 Strategic management tools 4. Previously published research results regarding SME	a) What is the relation of the managers' age with strategic management knowledge and practice?	Linear regression and ANOVA
4. Previously published research results regarding SME 5.6.4 The impact of SM practice upon performance	b) What is the relation of the managers' age with the performance outcomes of the company they lead?	Linear regression and ANOVA
4. Previously published research results regarding SME 5.4 Management education in Germany 5.6 SM practice, management education & performance	5. What is the relation of the managers' seniority with strategic management knowledge, practice, performance outcome, and education?	Hypothesis testing of data from research questions 1 & 2
2.7 Strategic management tools 4. Previously published research results regarding SME	a) What is the relation of the managers' seniority with strategic management knowledge and practice?	Linear regression and ANOVA
4. Previously published research results regarding SME 5.6.4 The impact of SM practice upon performance	b) What is the relation of the managers' seniority with the performance outcomes of the company they lead?	Linear regression and ANOVA
5.4 Management education in Germany	c) What is the relation of the managers' seniority with their education?	Compare means modelling and ANOVA
3.4 The German Mittelstand 4. Previously published research results regarding SME	6. What is the relation of the company size with strategic management knowledge and practice?	Hypothesis testing of data from research questions 1 & 2
2.7 Strategic management tools 3.4 The German Mittelstand 4. Previously published research results regarding SME	a) What is the relation of the company size with strategic management knowledge?	Linear regression and ANOVA
3.4 The German Mittelstand 4. Previously published research results regarding SME 5.6 SM practice, management education & performance	b) What is the relation of the company size with strategic management practice?	Linear regression and ANOVA
Critical assumption: Lack of strategic management education leads to the neglect or misuse of the strategic management processes and tools, and may induce underperformance of the business.		Partially known phenomenon > hypothesis testing > positivism > deductive > survey & micro case studies > cross sectional > questionnaire & sampling

ME = Machinery and equipment sector; SM = Strategic management

Table 6.11: Link of research questions with literature review and research design

Source: Developed by researcher

Figure 6.19 summarises the issues and conclusions drawn, the contribution to the research project made with this chapter and research questions arising.

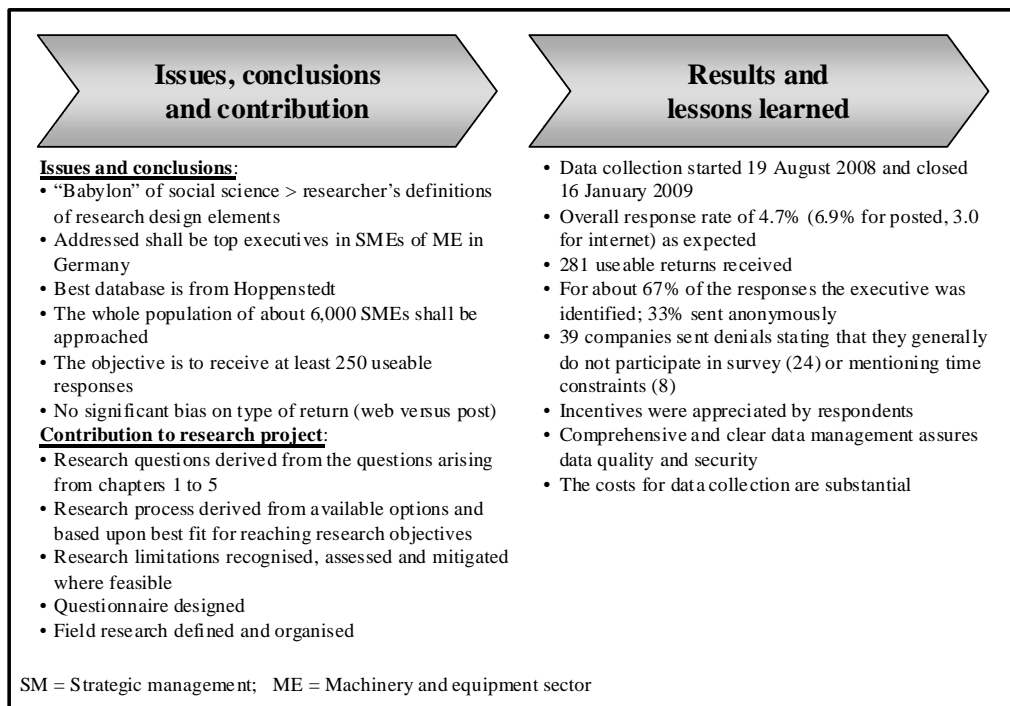


Figure 6.19: Chapter contribution and summary

Source: Developed by researcher

The next chapter goes on to describe and discuss in detail the empirical findings and results.

7 Research data documentation, analysis and evaluation

“Some men see the present and say: Why? I dream of things that never were and say: Why not?”

George Bernard Shaw (Quoted in Handelsblatt, 2005, p. 16)

7.1 Introduction

Chapter 6 has finally defined the specific research objectives and research questions, provided the most appropriate research process based upon the available elements of social and management research and prepared the field work for this research project. In addition the results and lessons learned from the field work carried out from August 19, 2008 until January 16, 2009 are described and discussed.

Figure 7.0 list the objectives for this chapter.

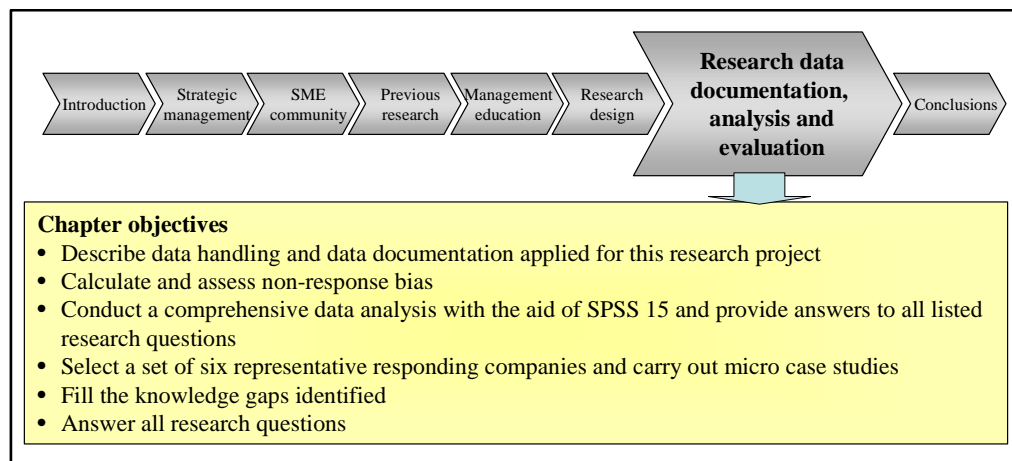


Figure 7.0: Objectives chapter 7

Source: Developed by researcher

In this chapter, the research data handling in SPSS15 and the Hoppenstedt database as well as the procedures for statistical modelling are described. The chapter goes on to analyse, evaluate and discuss in detail the research results derived from the survey. Qualitative data, obtained through open questions, is used to support quantitative evaluations. The research questions defined are answered and finally six micro case studies of selected companies are discussed.

After each sub-section, the findings and questions arising are briefly summarised.

7.2 Handling of data from the questionnaires

The researcher has made a commitment to the responding companies to treat all data received with the strictest confidentiality and to maintain anonymity of companies and executives. Thus, in the following sections case numbers and company numbers are used to identify, address and describe companies or executives.

7.2.1 Companies responding to survey

In Table 7.1 the identified companies responding to the survey and the respective case numbers allocated are listed. The company numbers listed correspond to the company numbers of the Hoppenstedt database.

Company number	Case Number	Company number	Case number	Company number	Case number	Company number	Case number	Company number	Case number
47	16	1365	8	2562	241	3762	120	4829	154
89	211	1397	177	2619	98	3774	132	4842	135
126	158	1417	198	2668	126	3798	236	4857	5
151	10	1420	4	2671	94	3926	249	4908	76
154	270	1425	176	2677	226	3945	25	4941	184
165	237	1455	18	2772	103	3953	115	4943	153
197	26	1505	251	2793	257	3974	86	4950	171
203	167	1548	234	2826	187	3976	1	4955	163
275	192	1570	143	2840	265	4049	173	5066	45
286	247	1575	141	2842	61	4094	258	5071	178
287	268	1602	3	2879	197	4239	113	5075	271
335	28	1604	250	3012	168	4240	75	5078	200
349	127	1618	36	3026	266	4245	74	5136	157
451	161	1651	181	3030	131	4288	130	5195	164
500	277	1675	191	3079	273	4293	71	5220	89
541	232	1724	194	3158	15	4298	202	5222	256
552	11	1740	37	3172	106	4361	125	5256	41
577	240	1743	116	3238	139	4379	85	5273	281
609	186	1768	60	3252	21	4421	280	5375	252
844	115	1781	235	3293	33	4426	133	5483	104
855	217	1893	174	3400	216	4448	156	5539	105
899	274	1987	204	3413	175	4449	92	5549	145
940	196	2004	254	3415	137	4457	267	5586	91
960	30	2144	32	3440	212	4516	39	5589	90
974	144	2181	146	3462	17	4519	218	5626	54
976	122	2272	63	3474	231	4526	108	5664	129
986	264	2278	208	3509	159	4548	77	5674	170
991	102	2286	183	3518	55	4579	58	5679	7
1031	48	2348	40	3536	93	4607	53	5690	275
1032	20	2360	209	3538	222	4617	238	5726	188
1037	70	2371	100	3552	155	4642	272	5757	123
1045	199	2423	96	3572	66	4710	166	5780	117
1063	185	2436	223	3591	136	4727	59	5929	50
1126	165	2446	203	3593	193	4733	229	5933	69
1201	42	2498	101	3665	225	4740	72	5956	49
1307	9	2508	52	3752	260	4783	210	5957	243
1341	34	2537	244	3756	190	4819	44	5958	261

Table 7.1: Companies responding to survey and case numbers

Source: Developed by researcher

7.2.2 Cases used for evaluation

In total, 290 responses were received until the end of the data collection period. The number of useable returns was 281 (96.9%) and the number of non-useable returns was 9 (3.1%). As indicated below, 12 useable responses (4.1%) were excluded for reasons of company size, reducing the final number of useable cases to 269.

The size of the companies responding to the survey questionnaire ranges from 3 to 1,150 employees. After the first assessment and discussion, it was decided to eliminate companies below 10 and above 500 employees from the evaluation for the following reasons. Companies below 10 employees are considered as micro companies by the definition of the European Commission (European Commission, 2005c). By the definition of the German IfM Institut fuer Mittelstandsforschung (Institute for SME Research),

companies above 500 employees are considered as LSEs, large size enterprises (Guenterberg & Kayser, 2004).

The following cases were eliminated:

- Case 38 > 900 employees
- Case 41 > 600 employees
- Case 46 > 600 employees
- Case 62 > 900 employees
- Case 80 > 510 employees
- Case 95 > 3 employees
- Case 97 > 550 employees
- Case 109 > 8 employees
- Case 135 > 900 employees
- Case 136 > 800 employees
- Case 187 > 1000 employees
- Case 248 > 1150 employees

In order to avoid a complete renumbering in the databases and correspondence, the initial case numbering was retained unchanged.

7.2.3 The issue of endogeneity

Webster (1983, p. 600) defines endogenous as “*developing from within; originating from internally*”. In the context of quantitative research and statistical modelling Nikolaev & Van Lent (2005, p. 680) define endogeneity “*as any situation where the ceteris paribus condition is not fulfilled whenever the independent variable of interest is changed*”. Neglecting the endogeneity issue may lead to false and misleading conclusions in research projects (Shaver, 1998).

Sources of endogeneity may be e.g. omitted variables, data manipulation, sample selection problems (Kennedy, 2003; Nikolaev & Van Lent, 2005).

Van Lent (2007) considers endogeneity as a regression specification problem but argues: “*That researchers should set aside endogeneity concerns when their research question is important*”. Firstly, there is often no definite answer whether endogeneity is present in a model and secondly, there are only a few solutions offered (Van Lent, 2007, p. 197).

The issue of endogeneity for this research project is considered as negligible for the following reasons:

- Relations between variables should be explored and not cause and effect.
- The single regression model is used (predictor and one dependent variable).

- An assessment of the variables (dependent and independent) selected for testing the relation via single regression model did not reveal any endogeneity problems.

7.2.4 Assessment of non-response bias

It is often argued that results from samples do not, or only in a conditional way, represent the total population. The reason cited is the difference between those responding and those who do not. Socha (2006) describes 3 types of non-responses:

- Unit non-response: The participation in any survey is declined.
- Item non-response: The answer to a certain question is declined.
- Non-response bias: The questionnaire is not answered by a particular group.

There were problems with item non-responses and non-response bias. The first was mitigated by using data such as the number of employees from the Hoppenstedt database for identified responses with missing answers. Otherwise, the case was excluded from evaluation.

For non-response bias, Armstrong & Overton (1977) suggest following methods for estimation:

- Comparison with known values from the population
- Subjective estimates, e.g. by determining the socioeconomic differences between responses and non-responses
- Extrapolation methods; “*successive waves of a questionnaire*” by following up with a postcard for instance (Armstrong & Overton, 1977; p. 397)

For this research project, the method of comparing values of responses with those of non-responses is the most appropriate method, since values of the total population are available within the Hoppenstedt database.

Filion (1974) and Colombo (2000) define the degree of non-response bias by:

$$\text{Bias} = (1 - r) * (\text{mean}_R - \text{mean}_{NR})$$

r = response rate = 4.72%; $1 - r = 0.9528$

mean = mean value of the variable considered

R = responding population

NR = non-responding population

In the following, several variables of responding and non-responding companies are compared and in addition the bias is calculated:

1. The average number of employees of the companies responding is 106.3. For non-responding companies the average number of employees is 89.7. Bias = $0.9528 * (106.3 - 89.7) = 16.6$ employees. The bias represents 3.4% of the overall range of the responding population from 10 to 500 employees
2. The average turnover of the companies responding is € 20.42 million. For non-responding companies the average turnover is € 16.0 million.

Bias = $0.9528 * (20.42 - 16.60) = € 3.82$ million. The bias represents 1.6% of the overall range of the responding population from € 12 million to € 239.2 million

3. The average year of foundation of the companies responding is 1958.8. For non-responding companies the average year of foundation is 1965.5. Bias = $0.9528 * (1957.8 - 1965.5) = -7.3$ years. The bias represents 2.8% of the overall range of the responding population from 1745 to 2005.
4. The average equity ratio of the companies responding is 32.62%. For non-responding companies the average equity ratio is 31.50%. Bias = $0.9528 * (32.62 - 31.50) = 1.1\%$. The bias represents 1.5% of the overall range of the responding population from 0 to 72.5%

Variable 1 and 2 show a bias of the responding population toward larger companies regarding number of employees and turnover. Variable 3 indicates a bias of responding companies towards those with a higher age. Variable 4 suggests a bias of the responding population toward a higher equity ratio.

Based upon the principles described above and calculations conducted, it can be concluded that there is no significant bias of the responding population compared to the non-responding population.

7.2.5 Data entry in SPSS

During the data collection period, data from questionnaires received was entered into the SPSS system. The data entry was completed on January 23, 2009. The average time for data entry was about twenty minutes per case.

In the course of the data entry, the coding plan had to be amended several times to include new variables, especially for the qualitative sections of the questionnaire. After changes, the coding plan was resaved under a new version number to allow traceability of the coding history.

After completion of the data entry, some variables, for instance the education of the respondents, were clustered. Some new variables, such as turnover per employee, were calculated.

The final version of the SPSS data set has 470 variables.

7.2.6 Data entry in Hoppenstedt database

In parallel to the SPSS data entry all qualitative data from open questions and comments, such as perception of strategic management, challenges the company is faced with and the action taken, was translated and entered into the Hoppenstedt database (Table 7.2).

Case No.	Additional SM tools (Q 1.6)	Management education (Q 1.7)	Peception of strategic management (Q 2.1)	Major challenges (Q3.13)	Action (Q 3.14)	Other comments
26	HR management, motivation, team building	strategic management has not been taught at time of study	set the company up in a future orientated way, work innovative that products of tomorrow secure the company and future income	manage cost situation; purchasing of material and energy	increase added value, turnover and company growth	Q1.9 > visited project management academy

Table 7.2: Handling of qualitative data in the Hoppenstedt database

Source: Developed by researcher

As the data entry was completed, a common coding scheme reflecting the elements of strategic management was developed for the questions 2.1 Perception of strategic management, 3.13 Major challenges ahead and 3.14 Measures to cope with challenges.

In addition to the data described in Table 7.2, comments on cases and ideas, e.g. for data evaluation, were recorded in the Hoppenstedt database along the data entry process.

This section has provided information regarding the responding population, an assessment of the non-response bias and the data entry procedures.

The next section goes on to describe the data analysis and evaluation procedures in SPSS version 15. In addition, the research questions and the responding section answering these questions are listed.

7.3 Data analysis and evaluation in SPSS version 15

SPSS version 15, used for this research project, is a powerful tool for analysing data, generating reports, charts and plots. It can not only provide descriptive statistics with frequencies, means, distributions, etc., but also complex statistical analyses. For data preparation and the following data analyses and evaluations a selection of handbooks and guidelines was used (Brosius, 1998); (Elsner, 2003); (Pryce, 2005); (Wisemann, 2005); (Moutinho & Hutcheson, 2006, 2008); (SPSS, 2006, 2006a); (Marques de Sà, 2007); (Baltes-Goetz, 2007, 2008); (Diehl & Staufenbiel, 2007); (Kinnear & Gray, 2008).

7.3.1 Descriptive statistics and graphics

The following types of analyses and graphics, to describe counts and categories of variables, are applied in the following sections of data evaluation:

- Frequencies to show count for a certain variable
- Minimum, maximum and range of values of a certain variable
- Mean of a variable $\bar{x} = \frac{\sum x_i}{n}$
- Variance of a variable $s^2 = \frac{1}{n-1} \sum (x_i - \bar{x})^2$
- Standard deviation of a variable $s = \sqrt{\frac{1}{n-1} \sum (x_i - \bar{x})^2}$
- Pie chart to emphasise proportions of categories in a variable
- Bar chart to emphasise the rank of categories in a variable via counts or means; visualise relation of 2 variables (x and y axis)
- Histogram to depict the distribution of values of a category

Some data was exported from SPSS 15 to Microsoft Excel and further analysed and evaluated.

7.3.2 Relation of variables, inference statistics and hypothesis testing

The following types of analyses and graphics to analyse relations between variables are applied in the following sections of data evaluation:

- Linear regression for exploring relations between continuous variables
- Comparison of means to evaluate the relation of continuous variables with categorical variables (ordinal, dichotomous, nominal)
- Cross tabulation, Pearson chi-square test to evaluate the relation between categorical variables (ordinal, dichotomous, nominal)
- Scatter plots to display and calculate the relation of continuous variables

For testing the relation of variables with statistical means, hypothesis testing can be applied by calculating the significance level. The latter is the probability (P) of rejecting the hypothesis H_0 . The greater the calculated significance level, the less significant is the relation between the variables evaluated (Pryce, 2005).

For instance, the following null hypothesis or alternative test hypothesis H_1 may be assumed:

- Hypothesis H_0 : Seniority is not related to the number of strategic management tools applied
- Hypothesis H_1 : Seniority is related to the number of strategic management tools applied

If the calculated probability P is ≤ 0.050 , then the null hypothesis is to be rejected and the alternative hypothesis H_1 is proven. This means that the null hypothesis is rejected if the chance of false rejection is no more than one in twenty (5%).

If the calculated P is > 0.050 then H_0 cannot be rejected at a 5% significance level. *“With other words, it can be concluded that H_0 is true, although statisticians are reluctant to say this in the positive”* (Pryce, 2005, p. 5-3).

Fisher (1959, p. 44) states that *“in general, tests of significance are based on hypothetical probabilities calculated from their null hypotheses. They do not generally lead to any probability statements about the real world, but to a rational and well-defined measure of reluctance to acceptance of the hypotheses they test”*. In other words, the researcher must be careful with the interpretation of significance levels and conclusion on the research population or the entire population.

In the analysis of variance (ANOVA) of variables, the probability is called significance and abbreviated to Sig.

7.3.3 Research questions and pertinent sections

The following table states the critical assumption and lists all research questions, sub-questions and the section they are answered in.

Critical assumption:	
Lack of strategic management education leads to the neglect or misuse of the strategic management processes and tools, and may induce underperformance of the business.	
Research question	Answered in section
1. What is the state of management education and, in particular, strategic management education of executives in the sector researched?	7.5
a) What strategic management knowledge was acquired in which area of education and via seminars or self-study?	7.5.1
b) What is the relation of the type of education with the acquisition of strategic management knowledge?	7.5.2
c) How do the responding executives rate the strategic management knowledge of their colleagues on the top executive level and the hierarchical level below?	7.5.3
d) Are the responding executives satisfied with the general and strategic management education during undergraduate or graduate studies? If not, why?	7.5.4
e) How much time do executives spend on continuing education regarding general and strategic management and which medium is used to acquire knowledge?	7.5.5
2. What is the current practice in strategic management in the sector researched?	7.6
a) What strategic management tools are applied in praxis?	7.6.1
b) What is the relation of the type of education with the application of strategic management knowledge?	7.6.2
c) What is the approach to strategic management in responding companies?	7.6.3
d) What are the motives and obstacles to strategic planning process?	7.6.4
e) What are the organisations and individuals doing to improve strategic management in their company?	7.6.5
f) What is the perception or understanding of the executives regarding strategic management?	7.6.6
g) What kind of challenges do the executives see ahead and how do they cope with them?	7.6.7
3. What is the relation of education and strategic management practice with the performance outcome?	7.7
a) What is the relation of education with the performance outcome?	7.7.1
b) What is the relation of continuing strategic management education with the performance outcome?	7.7.2
c) What is the relation of strategic management practice with the performance outcome?	7.7.3
4. What is the relation of the managers' age with strategic management knowledge, practice, and performance outcome?	7.8
a) What is the relation of the managers' age with strategic management knowledge and practice?	7.8.1
b) What is the relation of the managers' age with the performance outcomes of the company they lead?	7.8.2
5. What is the relation of the managers' seniority with strategic management knowledge, practice, performance outcome, and education?	7.9
a) What is the relation of the managers' seniority with strategic management knowledge and practice?	7.9.1
b) What is the relation of the managers' seniority with the performance outcomes of the company they lead?	7.9.2
c) What is the relation of the managers' seniority with their education?	7.9.3
6. What is the relation of the company size with strategic management knowledge and practice?	7.10
a) What is the relation of the company size with strategic management knowledge?	7.10.1
b) What is the relation of the company size with strategic management practice?	7.10.2

Table 7.3: Research questions and answers

Source: Developed by researcher

This section has described the data analysis and evaluation procedures in SPSS version 15. In addition, the research questions and the responding section answering these questions are listed.

The following sections provide descriptive statistics from the SPSS data set regarding basic demographic data of executives and companies responding to the survey request.

7.4 Basic demographics of responding persons / companies

The following sections analyse and evaluate data from the SPSS data set regarding basic demographics of executives and companies responding to the survey request. In total, 269 cases are used for evaluation.

7.4.1 Gender and age of the responding executives

Executive positions in the research sector are dominated by men: of the 269 respondents, 251 (93.3%) are men and 17 (6.3%) are women. In one response, gender was not indicated. This proves that women are still in the minority of executive positions in the research sector.

As depicted in Figure 7.1 the age of the respondents ranges from 23 to 75 years. The average age of executives in the research sector is about 49 years.

The retirement age in Germany is still 65: however, ten executives have passed that age. Eight of them are managing partners, two are managing directors and, of that number, seven are engineers. This confirms the issue of late handover to the next generation and the associated problems for companies concerned (Kayser, 2004; Gruhler, 1998; Ballarini & Keese, 2002; Boes & Kayser, 1996). Compared to other professions, engineers remain longer as managers after the official retirement age.

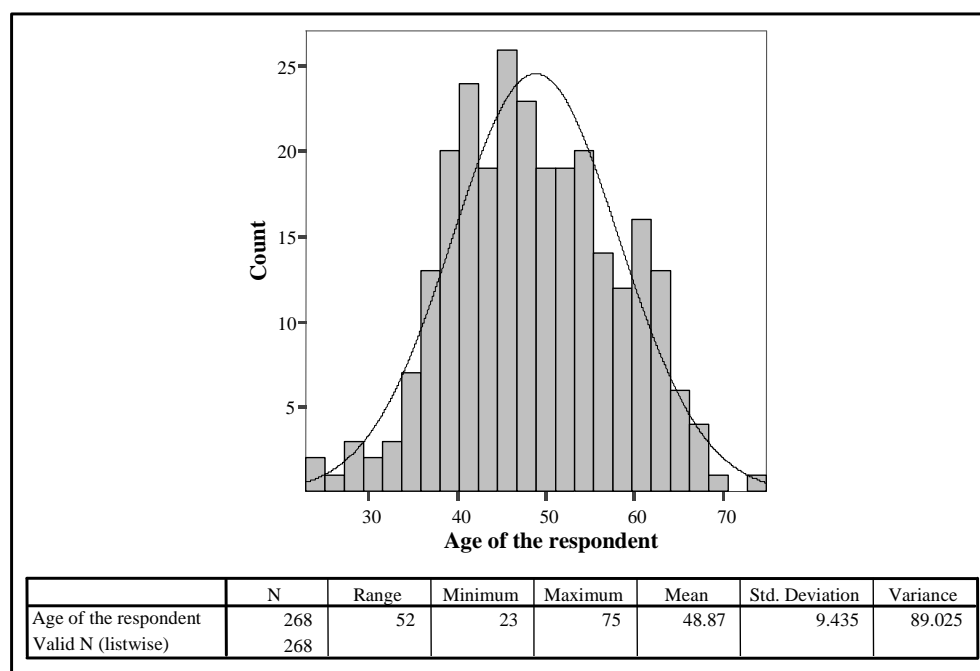


Figure 7.1: Age distribution of respondents

Source: Developed by researcher

Summary of findings from this sub-section:

- Women are in the minority of executive positions in the research sector.
- The age of the respondents ranges from 23 to 75 years.
- After the official retirement age, engineers stay on as managers.

7.4.2 Education, position and seniority of respondents

Note: As described in section 6.4.3 the term “seniority” is used as a synonym for the “number of years the respondent has spent the current position”. 42% of the top hierarchical level in the research sector is dominated by executives with a university degree in engineering (Dipl.-Ing.) (Figure 7.2). 27.1% of business economists (Dipl.-Kfm.) are represented in the top level and are then followed by those who have received a technical education leading to qualifications such as Facharbeiter (professional), Meister (master) or Techniker (technician) (10%). Executives with a business engineering degree (Dipl.-Wirtsch.-Ing.) represent with 9.3%, followed by MBAs (6.3%). MBAs still play a minor role in the research sector. However, with the introduction of the Bologna Accord (BMWF, 2008b) MBAs are gaining ground. Other educations such as chemists, physicists, or accountants are the exception in the top executive level.

For a detailed listing of the education of the respondents see appendix B, Figure Apx. 1.

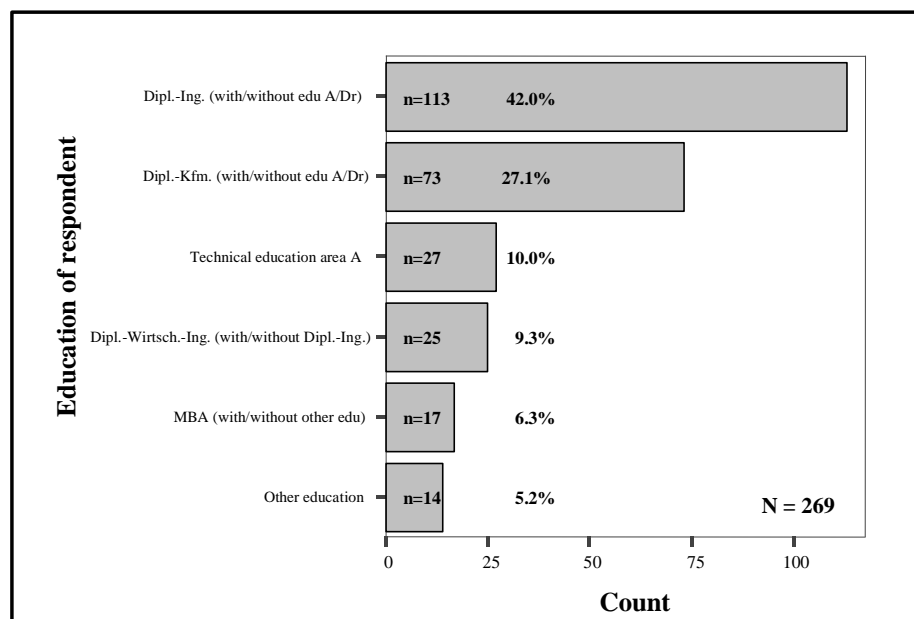


Figure 7.2: Education of the respondents

Source: Developed by researcher

As depicted in Figure 7.3, about 60% of the respondents are managing partners or owners of the company and 31.6% are managing directors. Thus 246 of 269 responding persons (91.5%) are on the top hierarchical level and the decision makers in the respective companies. The remainder (23; 8.5%) are on the second hierarchical level. This ratio of top decision makers and those in the second hierarchical level is better than initially expected by the researcher.

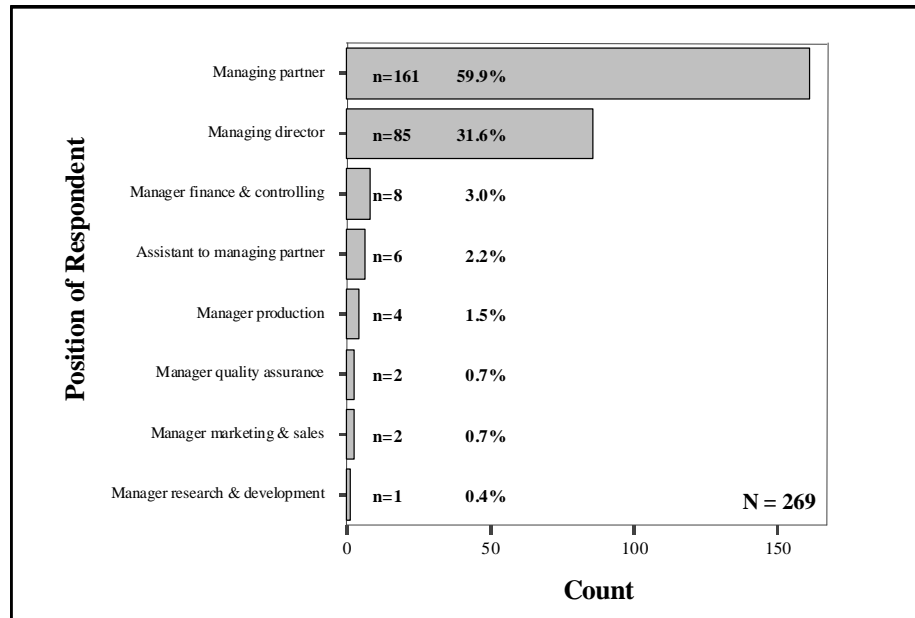


Figure 7.3: Position of the responding persons

Source: Developed by researcher

On average, executives in the research sector have been 10.4 years in their current position. Seniority ranges from 1 to 37 years. Managing partners, the owners of the companies, are on average, 12.6 years in their current position (Figure 7.4). The high average of seniority stems from the fact that a large proportion of the owners often stay with the company from start, buy in or buy out until retirement. Employed managing directors often move on after some years.

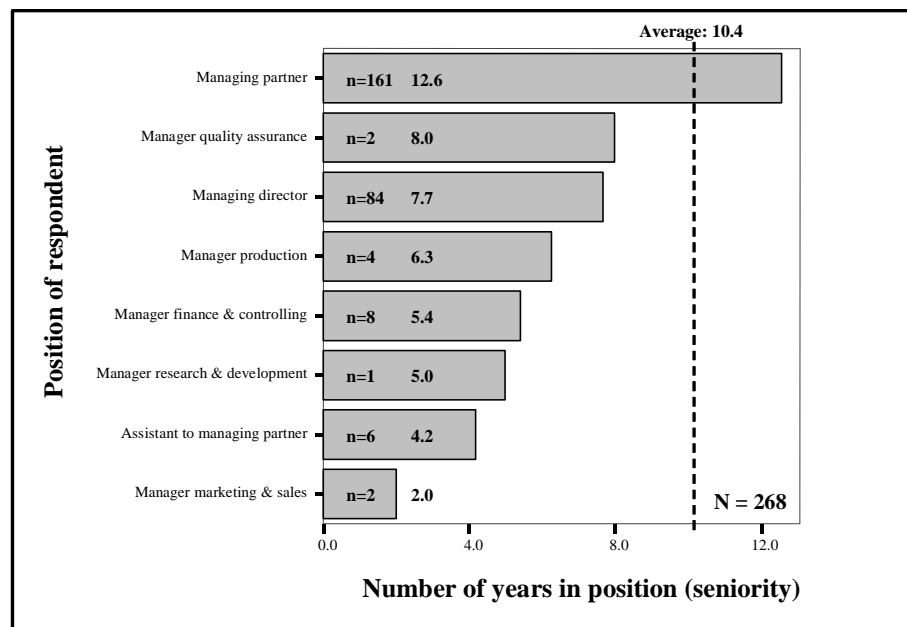


Figure 7.4: Number of years in current position (seniority)

Source: Developed by researcher

With the aid of the SPSS “compare means” modelling and the ANOVA table the relation of the number of years in position with the position of the respondent was evaluated. The differences between the groups are statistically significant (Sig. 0.000). Thus, the average seniority is related to and dependent upon position of the respondent.

Summary of findings from this sub-section:

- Engineers dominate with a share of 42.0% the top hierarchical level.
- 91.5% of the responding persons are on the top hierarchical level and the decision makers.
- On average, executives are 10.4 years in the current position.
- Managing partners are on average 12.6 years in the current position.

7.4.3 Number of employees and turnover of responding companies

Figure 7.5 shows the distribution of the number of employees in responding companies. It ranges from 13 to 500 employees. The average company size is about 106 employees.

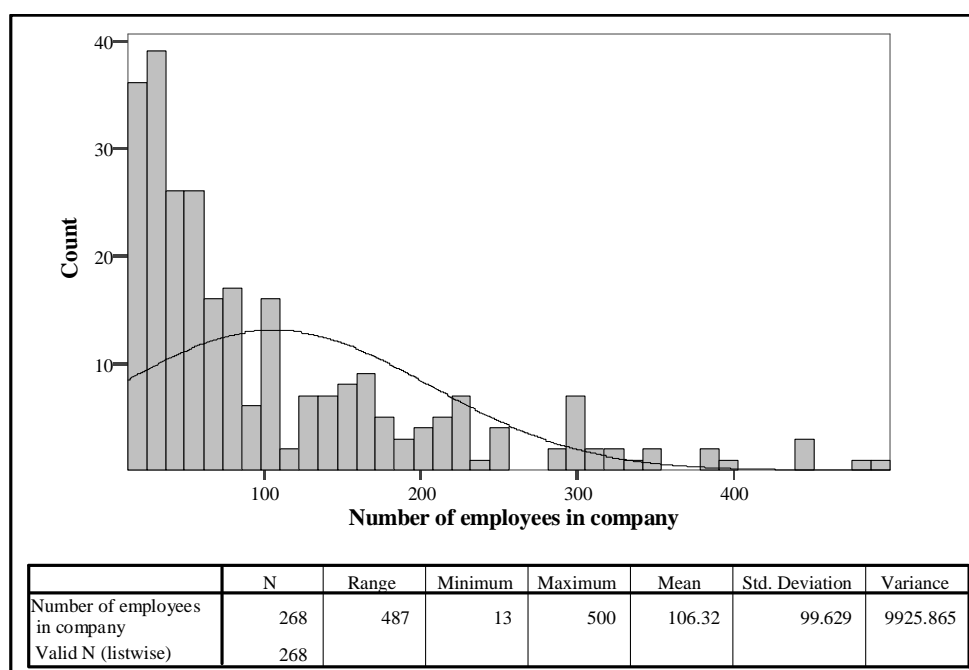


Figure 7.5: Number of employees of responding companies

Source: Developed by researcher

Figure 7.6 depicts the distribution of the turnover of responding companies. It ranges from € 1.2 to 239.2 million. The average is € 20.42 million. The outlying company with a turnover of € 239 million is a company with a low level of vertical integration, producing equipment for the construction industry. The turnover was confirmed in the Hoppenstedt database.

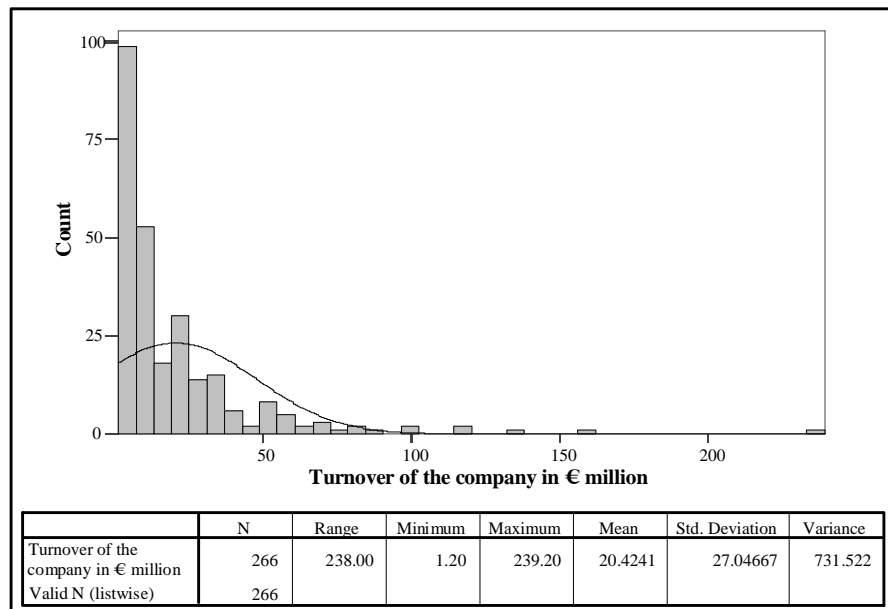


Figure 7.6: Turnover of responding companies

Source: Developed by researcher

The following additional basic demographic information from the survey is depicted in appendix B, figures Apx.2 to Apx.12:

- Distribution of the legal form of responding companies
- Distribution of the year the responding companies were founded
- Distribution of the branch the responding companies belong to (NACE code)
- Integration status of the responding companies
- Merger and acquisition activities of the responding companies
- Anomalies the responding companies were faced with in the business year 2007; reported quantified anomalies were considered in the data analysis
- Distribution of the turnover per employee of responding companies
- Distribution of the return on sales of the responding companies
- Distribution of the equity ratio of the responding companies
- Distribution of the R&D ratio of the responding companies
- Distribution of the suggestions per employee of the responding companies

Summary of findings from this sub-section:

- Number of employees of response population ranges from 13 to 500.
- Turnover of response population ranges from € 1.2 to 239.2 million.

This section has provided basic facts and figures for the responding companies. As expected, the top positions in the research sector are dominated by engineers. The high proportion of those on the top hierarchical level (91.5%) is favourable for this research project. Women are still in the minority. The entire range of company sizes and branch affiliations (NACE codes) is represented in the research population.

The next section will go on to evaluate research data to answer the research question 1.

7.5 The state of management education in the research sector

The following sections analyse and evaluate data from the SPSS data set regarding knowledge of strategic management tools of executives responding to the survey request as well as information on continuing education. The aim is to answer research question 1: “What is the state of management education and, in particular, strategic management education of executives in the sector researched?” as well as corresponding sub-questions.

As depicted in Table 7.4, strategic management tools can be clustered in phases of strategic management. The phases of strategic management represent from top to the bottom the strategic management process as discussed and described in chapter 2.

Strategic management tool	No	Phase of strategic management
Benchmarking	1	Strategic analysis and assessment
SWOT	2	
Five competitive forces (Porter)	3	
Scenario technique	4	
Vision	5	Strategic premises and settings
Mission statement	6	
Corporate identity programme	7	
BCG growth-share matrix	8	Strategy formulation
Attractiveness-business-strengths matrix	9	
Market-life-cycle-compet.-strength matr.	10	
Product market grid (Ansoff)	11	
Strategy maps	12	
Quality management ISO 9000	13	Operations strategy
TQM (total quality management)	14	
EFQM model	15	
Six sigma	16	
Supply chain management	17	
Continuous improvement programme	18	HR strategy
Skill management	19	
Change management	20	
Market segment./different./position.	21	Marketing strategy
Marketing mix (Kotler, 4 Ps)	22	
Key account management	23	
Innovation management	24	R&D strategy
Knowledge management	25	Finance strategy
Overhead value analysis	26	
Zero base budgeting	27	
Activity database	28	Strategy execution and controlling
Balanced scorecards	29	
Risk management system	30	
Early warning system	31	

Table 7.4: Strategic management tools

Source: Developed by researcher

7.5.1 Strategic management tools acquired

This sub-section answers research sub-question 1a: What strategic management knowledge was acquired in which area of education and via seminars or self-study? Table 7.5 lists the acquired strategic management tools in the educational areas A, B and C as well as in seminars or via self-study. In column “acquired” the tools learned in these educational areas are added up. The following columns list the strategic management tools which are not known at all or which have not been acquired. The overall count of management tool elements of the responding population is 7,881. About 4,500 tool elements were acquired (57.1%) and 3,380 tool elements were not acquired (42.9%) by the executives.

SM tool	Educational area A, pre-graduate		Educational area B, graduate		Educational area C, post-graduate		In seminars		Self-study		Acquired		No knowledge		Tool unknown		Not acquired		Total	
	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%
Benchmarking	4	1.6%	64	24.8%	18	7.0%	56	21.7%	56	21.7%	198	76.7%	44	17.1%	16	6.2%	60	23.3%	258	100%
SWOT	1	0.4%	43	16.9%	20	7.8%	45	17.6%	32	12.5%	141	55.3%	55	21.6%	59	23.1%	114	44.7%	255	100%
Five competitive forces (Porter)	1	0.4%	40	15.8%	16	6.3%	13	5.1%	16	6.3%	86	34.0%	71	28.1%	96	37.9%	167	66.0%	253	100%
Scenario technique	2	0.8%	45	17.7%	15	5.9%	35	13.8%	41	16.1%	138	54.3%	64	25.2%	52	20.5%	116	45.7%	254	100%
Vision	1	0.4%	43	16.8%	19	7.4%	59	23.0%	53	20.7%	175	68.4%	46	18.0%	35	13.7%	81	31.6%	256	100%
Mission statement	1	0.4%	30	12.0%	16	6.4%	38	15.3%	33	13.3%	118	47.4%	60	24.1%	71	28.5%	131	52.6%	249	100%
Corporate identity programme	1	0.4%	60	23.5%	12	4.7%	64	25.1%	55	21.6%	192	75.3%	33	12.9%	30	11.8%	63	24.7%	255	100%
BCG growth-share matrix	1	0.4%	62	24.6%	16	6.3%	37	14.7%	27	10.7%	143	56.7%	52	20.6%	57	22.6%	109	43.3%	252	100%
Attractiveness-business-strengths matrix	0		44	17.4%	16	6.3%	26	10.3%	25	9.9%	111	43.9%	66	26.1%	76	30.0%	142	56.1%	253	100%
Market-life-cycle-compet.-strength matr.	2	0.8%	80	31.1%	19	7.4%	34	13.2%	29	11.3%	164	63.8%	45	17.5%	48	18.7%	93	36.2%	257	100%
Product market grid (Ansoff)	0		45	17.9%	10	4.0%	15	6.0%	15	6.0%	85	33.7%	75	29.8%	92	36.5%	167	66.3%	252	100%
Strategy maps	1	0.4%	22	8.7%	12	4.8%	29	11.5%	26	10.3%	90	35.7%	73	29.0%	89	35.3%	162	64.3%	252	100%
Quality management ISO 9000	9	3.5%	43	16.6%	12	4.6%	120	46.3%	62	23.9%	246	95.0%	8	3.1%	5	1.9%	13	5.0%	259	100%
TQM (total quality management)	2	0.8%	42	16.3%	10	3.9%	72	28.0%	52	20.2%	178	69.3%	55	21.4%	24	9.3%	79	30.7%	257	100%
EFQM model	0		11	4.4%	5	2.0%	22	8.7%	24	9.5%	62	24.6%	96	38.1%	94	37.3%	190	75.4%	252	100%
Six sigma	2	0.8%	14	5.5%	8	3.1%	40	15.7%	43	16.9%	107	42.0%	94	36.9%	54	21.2%	148	58.0%	255	100%
Supply chain management	1	0.4%	45	17.6%	11	4.3%	53	20.8%	62	24.3%	172	67.5%	57	22.4%	26	10.2%	83	32.5%	255	100%
Continuous improvement programme	4	1.6%	54	20.9%	16	6.2%	82	31.8%	75	29.1%	231	89.5%	18	7.0%	9	3.5%	27	10.5%	258	100%
Skill management	0		17	6.7%	12	4.8%	24	9.5%	33	13.1%	86	34.1%	92	36.5%	74	29.4%	166	65.9%	252	100%
Change management	0		20	8.0%	18	7.2%	40	15.9%	37	14.7%	115	45.8%	83	33.1%	53	21.1%	136	54.2%	251	100%
Market segment./different./position.	0		60	23.8%	16	6.3%	43	17.1%	49	19.4%	168	66.7%	60	23.8%	24	9.5%	84	33.3%	252	100%
Marketing mix (Kotler, 4 Ps)	0		61	24.2%	15	6.0%	17	6.7%	19	7.5%	112	44.4%	65	25.8%	75	29.8%	140	55.6%	252	100%
Key account management	1	0.4%	58	22.8%	17	6.7%	50	19.7%	59	23.2%	185	72.8%	46	18.1%	23	9.1%	69	27.2%	254	100%
Innovation management	2	0.8%	40	15.7%	14	5.5%	53	20.9%	65	25.6%	174	68.5%	56	22.0%	24	9.4%	80	31.5%	254	100%
Knowledge management	2	0.8%	36	14.0%	13	5.1%	45	17.5%	67	26.1%	163	63.4%	65	25.3%	29	11.3%	94	36.6%	257	100%
Overhead value analysis	7	2.7%	70	27.2%	14	5.4%	48	18.7%	48	18.7%	187	72.8%	43	16.7%	27	10.5%	70	27.2%	257	100%
Zero base budgeting	0		36	14.2%	10	3.9%	21	8.3%	20	7.9%	87	34.3%	79	31.1%	88	34.6%	167	65.7%	254	100%
Activity database	0		14	5.5%	8	3.2%	20	7.9%	52	20.6%	94	37.2%	90	35.6%	69	27.3%	159	62.8%	253	100%
Balanced scorecards	0		28	11.1%	13	5.1%	56	22.1%	45	17.8%	142	56.1%	62	24.5%	49	19.4%	111	43.9%	253	100%
Risk management system	4	1.6%	35	13.7%	18	7.0%	56	21.9%	79	30.9%	192	75.0%	37	14.5%	27	10.5%	64	25.0%	256	100%
Early warning system	0		36	14.2%	14	5.5%	40	15.7%	69	27.2%	159	62.6%	55	21.7%	40	15.7%	95	37.4%	254	100%
Total	49	0.6%	1,298	16.5%	433	5.5%	1,353	17.2%	1,368	17.4%	4,501	57.1%	1,845	23.4%	1,535	19.5%	3,380	42.9%	7,881	100%

Table 7.5: Strategic management tools acquired by executives

Source: Developed by researcher

Figure 7.7 visualises the percentages of strategic management tools that were acquired by the executives in the different educational areas and those which were not acquired or were unknown.

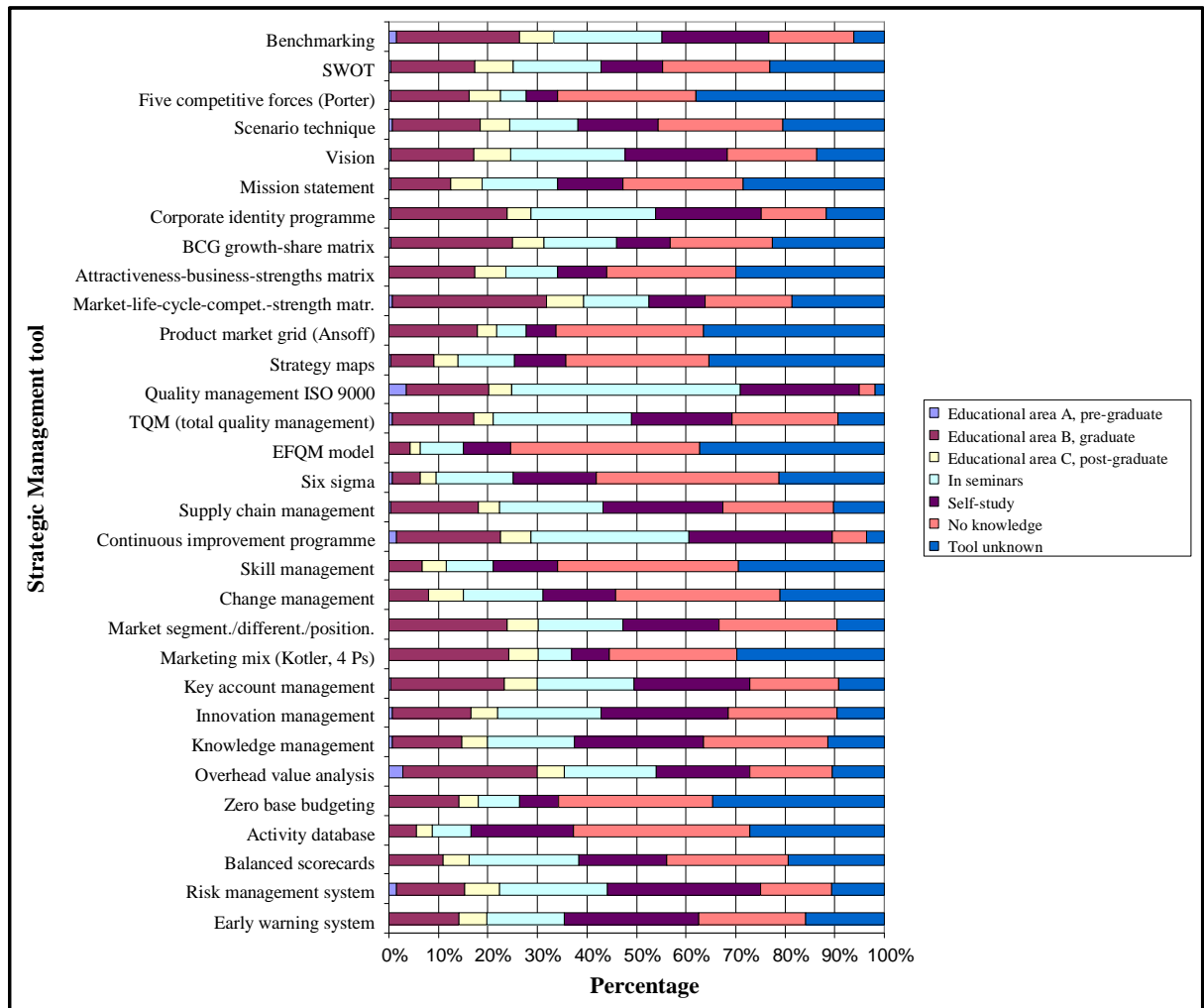


Figure 7.7: Strategic management tools acquired in educational areas (1)

Source: Developed by researcher

The pie chart in Figure 7.8 depicts the summary regarding tools acquired by the executive in different educational areas. Educational area A, pre-graduate, plays a minor role with only 0.6% share. Educational area B and C represent important sources of knowledge with 16.5% and 5.5% of the total number of acquired tools. More knowledge of strategic management tools was acquired in seminars (17.2%) and via self-study (17.4%). However, knowledge of 19.5% of the tools is lacking and 23.4% of them are not known at all.

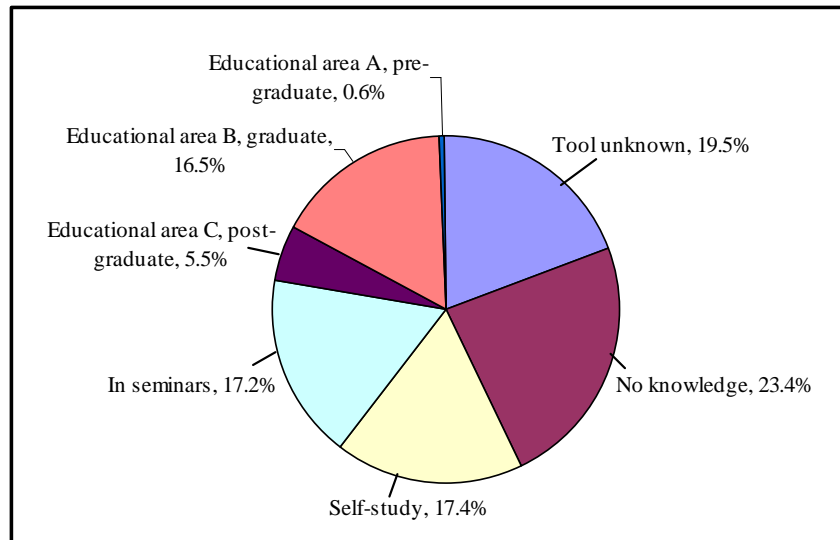


Figure 7.8: Strategic management tools acquired in educational areas (2)

Source: Developed by researcher

Figure 7.9 depicts the strategic management tools acquired by the executives sorted by percentages. For quality management knowledge penetration is at the highest level. This stems from the fact that most German companies in the research sector are ISO 9001 certified and the executives in charge had to acquire pertinent knowledge. Other tools such as continuous improvement programme, often called Kaizen (Imai, 1992), benchmarking, or risk management are also widely known. Other tools such as EFQM, Ansoff's product-market grid or Porter's five competitive forces are less known. The lack of knowledge (44.4% of the respondents) in operative marketing of Kotler's marketing mix should be noted.

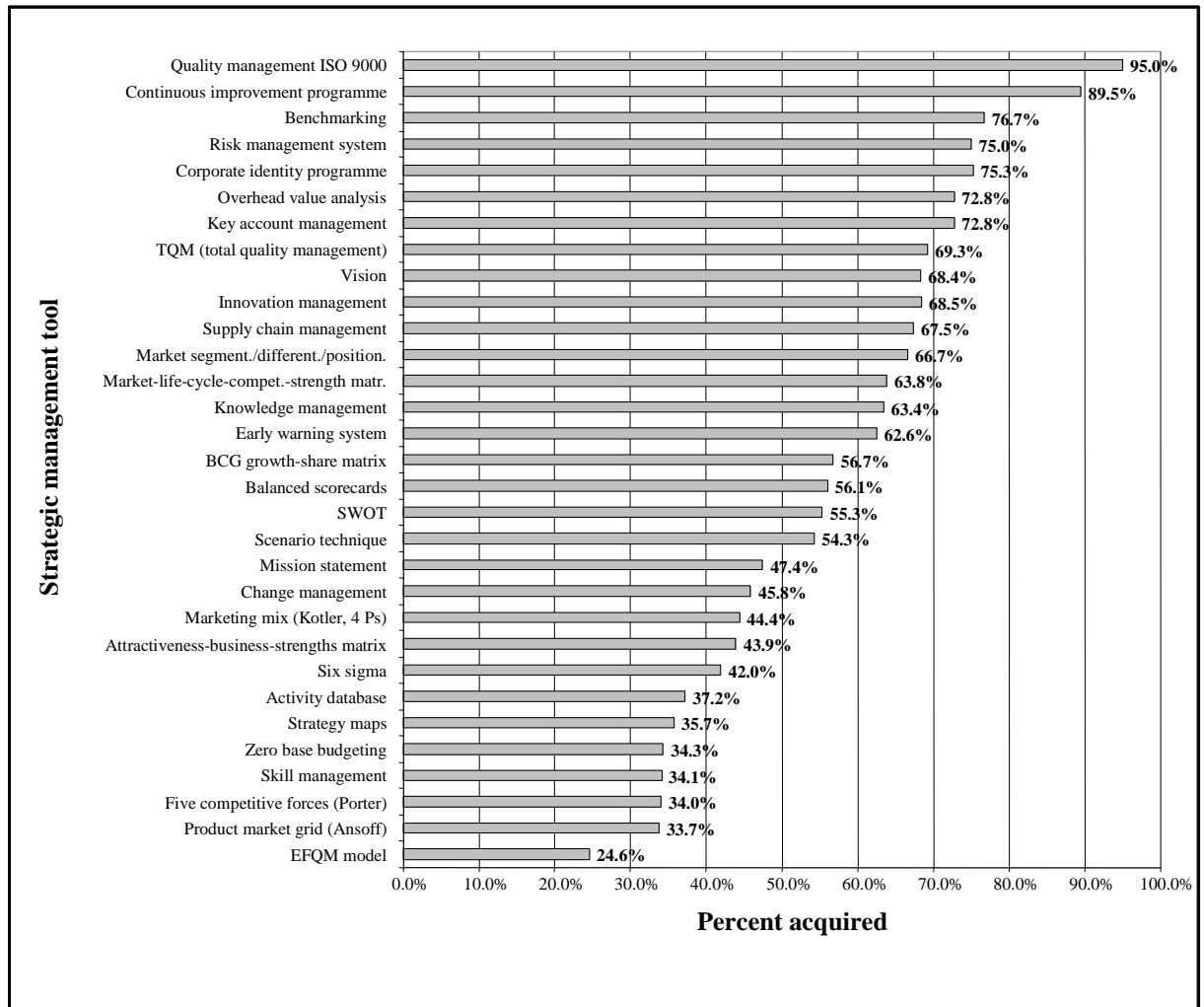


Figure 7.9: Strategic management tools acquired (sorted by percent)

Source: Developed by researcher

Figure 7.10 depicts the strategic management tool knowledge rate which is a calculated variable. It is calculated by dividing the respondent's sum of acquired strategic management tools by 31, the total number of tools. The average knowledge rate is 55.2%. It ranges from 0% to 100%. Thus, the responding population has knowledge acquired for only about half of the strategic management tools. In light of the high number of respondents in top management positions (91.5%) and who are responsible for strategic management, this appears to be a low knowledge rate.

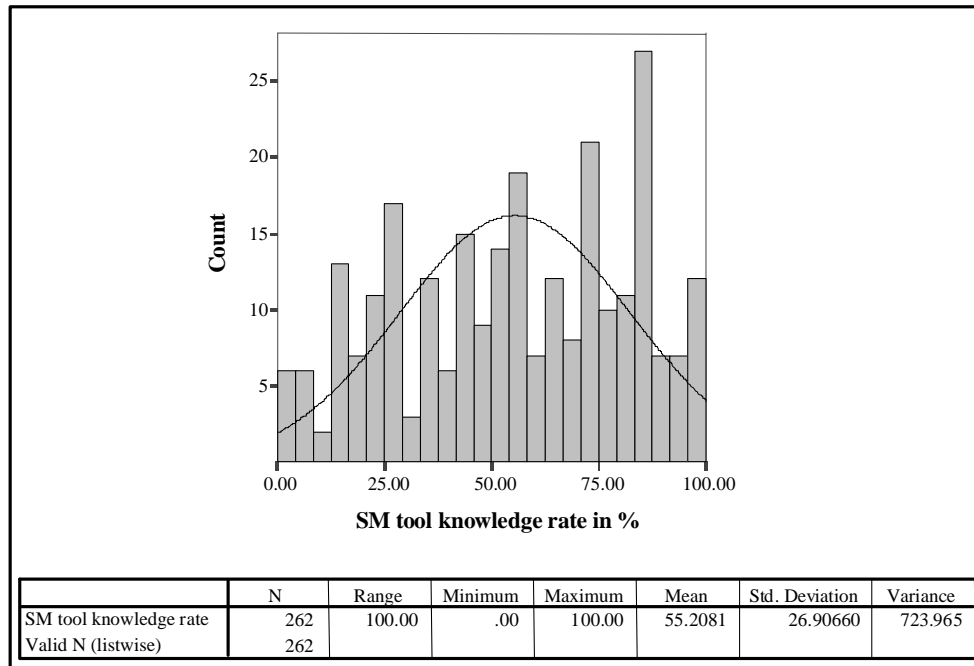


Figure 7.10: Strategic management tool knowledge rate

Source: Developed by researcher

Summary of findings from this sub-section:

- More strategic management knowledge is acquired in seminars (17.2%) and via self-study (17.4%) than during graduate (16.5%) and postgraduate university study (5.5%).
- The highest knowledge penetration is for quality management and the lowest for EFQM.
- Average strategic management tool knowledge is 55% for top executives.

Question arising from this sub-section:

- How does this knowledge profile compare to the knowledge situation in other industry sectors?

7.5.2 The relation of education with knowledge acquisition

This sub-section answers research sub-question 1b: What is the relation of the educational type with the acquisition of strategic management knowledge?

The relation of the acquisition of knowledge regarding the 31 individual strategic management tools with the type of education was evaluated via cross tabulation and Pearson chi-square test. Table 7.6 depicts the significance levels. For the majority of the tools, there is a significant statistical difference within the type of education and the knowledge acquisition of these management tools is related to that. Looked at in detail, the difference for most of the highly significant tools relates to the under-representation of engineers in the acquisition of management knowledge.

No	Strategic management tool	Level of significance Sig.
1	Benchmarking	0.000
2	SWOT	0.000
3	Five competitive forces (Porter)	0.000
4	Scenario technique	0.000
5	Vision	0.035
6	Mission statement	0.000
7	Corporate identity programme	0.000
8	BCG growth-share matrix	0.000
9	Attractiveness-business-strengths matrix	0.000
10	Market-life-cycle-compet.-strength matr.	0.000
11	Product market grid (Ansoff)	0.000
12	Strategy maps	0.002
13	Quality management ISO 9000	0.414
14	TQM (total quality management)	0.006
15	EFQM model	0.059
16	Six sigma	0.002
17	Supply chain management	0.000
18	Continuous improvement programme	0.004
19	Skill management	0.000
20	Change management	0.000
21	Market segment./different./position.	0.000
22	Marketing mix (Kotler, 4 Ps)	0.000
23	Key account management	0.007
24	Innovation management	0.138
25	Knowledge management	0.277
26	Overhead value analysis	0.000
27	Zero base budgeting	0.000
28	Activity database	0.283
29	Balanced scorecards	0.000
30	Risk management system	0.000
31	Early warning system	0.000

Table 7.6: Significance levels strategic management tools acquired

Source: Developed by researcher

Table 7.7 shows the data of four tools further analysed. The last column indicates the penetration of the education type regarding the pertinent strategic management tool. The first two examples, benchmarking and marketing mix (both Sig. 0.000), reveal the under-representation of engineers. The lack of marketing knowledge of engineering executives in the research population is remarkable.

The last two examples, quality management and innovation management, are typical engineer's domains. With regard to these tools, engineers are equally represented. Quality management (RWTH, 2003; FHWS, 2007) is part of the curricula of engineering universities in Germany. Engineers are mostly assigned in companies of the research sector to implement and to maintain a quality management system according to ISO 9001. Thus they had to acquire pertinent knowledge.

Benchmarking			
Education type	Acquired	Count	Penetration
Technical education area A	14	27	51,9%
Dipl.-Ing. (with/without edu A/Dr)	73	113	64,6%
Dipl.-Kfm. (with/without edu A/Dr)	63	73	86,3%
Dipl.-Wirtsch.-Ing. (with/without Dipl.-Ing.)	24	25	96,0%
MBA (with/without other edu)	17	17	100,0%
Other education	7	14	50,0%
Total	198	269	73,6%
Marketing mix (Kotler, 4 Ps)			
Education type	Acquired	Count	Penetration
Technical education area A	5	27	18,5%
Dipl.-Ing. (with/without edu A/Dr)	23	113	20,4%
Dipl.-Kfm. (with/without edu A/Dr)	48	73	65,8%
Dipl.-Wirtsch.-Ing. (with/without Dipl.-Ing.)	16	25	64,0%
MBA (with/without other edu)	12	17	70,6%
Other education	8	14	57,1%
Total	112	269	41,6%
Quality management ISO 9000			
Education type	Acquired	Count	Penetration
Technical education area A	23	27	85,2%
Dipl.-Ing. (with/without edu A/Dr)	105	113	92,9%
Dipl.-Kfm. (with/without edu A/Dr)	67	73	91,8%
Dipl.-Wirtsch.-Ing. (with/without Dipl.-Ing.)	23	25	92,0%
MBA (with/without other edu)	17	17	100,0%
Other education	11	14	78,6%
Total	246	269	91,4%
Innovation management			
Education type	Acquired	Count	Penetration
Technical education area A	15	27	55,6%
Dipl.-Ing. (with/without edu A/Dr)	71	113	62,8%
Dipl.-Kfm. (with/without edu A/Dr)	50	73	68,5%
Dipl.-Wirtsch.-Ing. (with/without Dipl.-Ing.)	18	25	72,0%
MBA (with/without other edu)	15	17	88,2%
Other education	5	14	35,7%
Total	174	269	64,7%

Table 7.7: Knowledge penetration of education types

Source: Developed by researcher

Figure 7.11 depicts the mean values of strategic management tool knowledge rate in percent of the different types of educational sorted by the knowledge rate. The average knowledge rate is at 55.2%. MBAs reach the highest average knowledge rate at 82.2%, followed by business economists and business engineers at 67.4% and 65.6%. This confirms the effort of the economic faculties of German universities and, in particular, the effort of business schools regarding management education. Engineers and executives with other technical education show the lowest rates of 44.5% and 42.5%, which proves they lack knowledge in strategic management.

Table Apx.1 in appendix B supports this assumption. In this table, strategic management tools acquired during university (education area B) and via seminars or self-study are listed by different types of education. Engineers acquired only 200 tools at the university (13.4%) and 1296 (86.6%) through seminars or self-study. The most important source of strategic management knowledge for the engineer is self-study (49.0%). In contrast, business economists acquired 772 tools (53.7%) at university, the most important source of their management knowledge and 665 (46.3%) from seminars and self-study. This strongly suggests a lack of management education at the engineering faculties of German universities.

With the aid of the SPSS “compare means” modelling and the ANOVA table the relation

of the strategic management tool knowledge rate with the type of education was evaluated. The differences between the groups are statistically significant (Sig. 0.000). Thus the average strategic management tool knowledge rate is related to and depending upon the type of education.

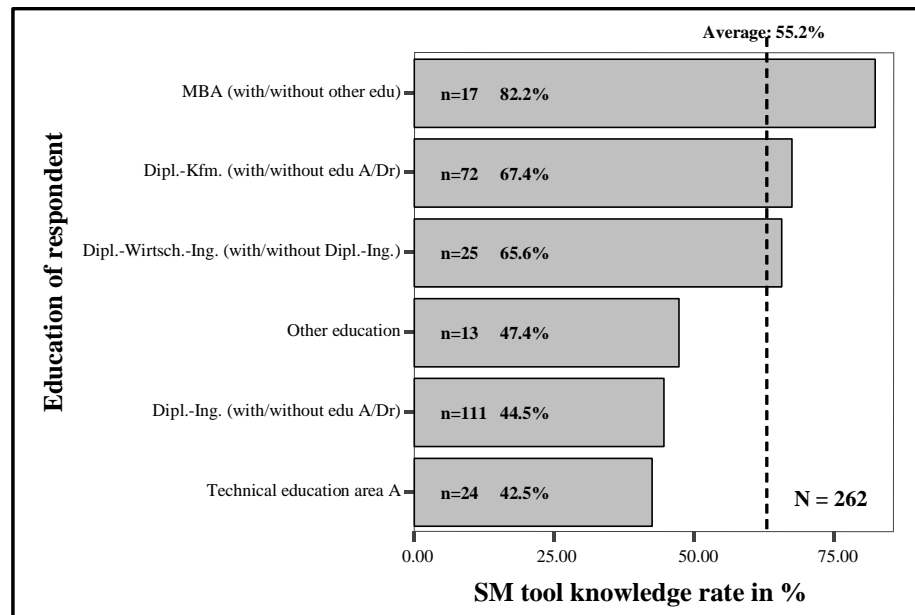


Figure 7.11: Average SM tool knowledge rate of education types

Source: Developed by researcher

Summary of findings from this sub-section:

- Significant relation between the strategic management tool knowledge rate and the type of education.
- Significant differences stem from the under-representation of engineers in the acquisition of knowledge of certain strategic management tools.
- Engineers in an executive position lack marketing knowledge.
- Quality management and innovation management, typical engineer's domains, show high knowledge penetration for engineers.
- Engineers acquire most of their strategic management knowledge in seminars or via self-study.

Question arising from this sub-section:

- Why do engineering faculties of German universities offer little or no management education for engineers?

7.5.3 Rating of strategic management knowledge of other executives

This sub-section answers research sub-question 1c: How do the responding executives rate the strategic management knowledge of their colleagues on the top executive level and the hierarchical level below?

In order to obtain information regarding top executive colleagues or those at the second

hierarchical level, the respondents were asked to rate the strategic management knowledge of people in other functions. Figure 7.11 shows the rating results. The strategic management knowledge of their senior executive colleagues is rated by the respondents with over 50% as excellent or good. The knowledge of finance & controlling managers or marketing & sales managers is also rated above 50% as excellent or good. Production managers and R&D managers, usually engineers, receive a lower rating for excellent or good knowledge (far below 50%). These findings confirm the evidence that engineers lack management education as found in the preceding sub-section.

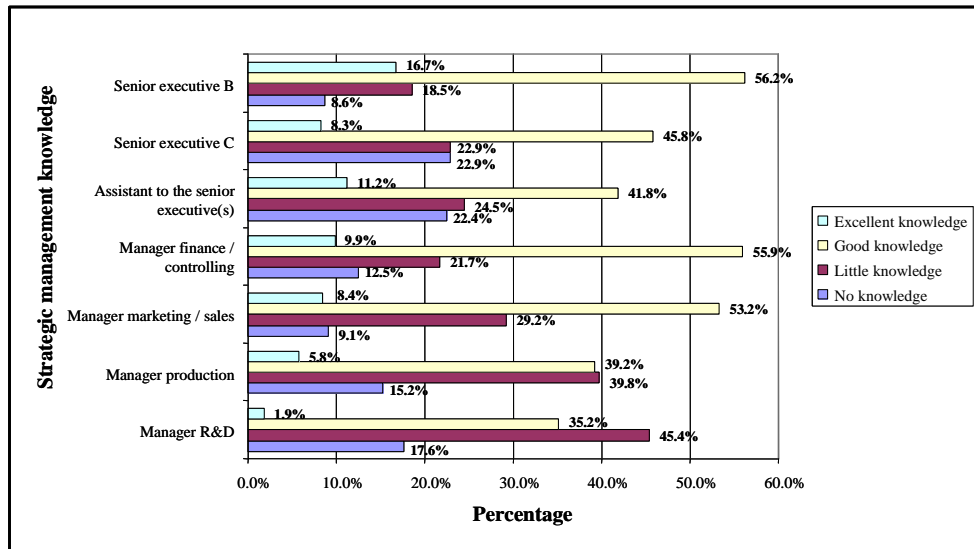


Figure 7.12: Rating of SM knowledge of other executives by respondents

Source: Developed by researcher

Summary of findings from this sub-section:

- Respondents rate the strategic management knowledge of managers with an engineering education lower than that of managers with a business economics background.

7.5.4 Satisfaction of respondents with their management education

This sub-section answers research sub-question 1d: Are the responding executives satisfied with the general and strategic management education during undergraduate or graduate studies? If not, why?

Table 7.8 lists the degree of satisfaction of respondents with their management education. Respondents with education in area A are mostly satisfied with their management education. Engineers are more dissatisfied with their management education at university (41 very satisfied/satisfied; 56 dissatisfied/very dissatisfied). For business economists, there is a different picture. 57 respondents state that they are very satisfied or satisfied. Only 9 are dissatisfied or very dissatisfied. Most of the business engineers claim also to be satisfied (18 very satisfied/satisfied; 4 dissatisfied/very dissatisfied). It is noteworthy that 8 of 17 responding MBAs are dissatisfied or very dissatisfied with management education at their business school. The findings suggest that there is room for improvements in

management education at universities and business schools.

Education	Satisfaction in education A				Satisfaction in education B				Satisfaction in education C, MBA			
	Very satisfied	Satisfied	Dissatisfied	Very dissatisfied	Very satisfied	Satisfied	Dissatisfied	Very dissatisfied	Very satisfied	Satisfied	Dissatisfied	Very dissatisfied
Technical education area A	5	14	3									
Dipl.-Ing. (with/without edu A/Dr)	3	14	11	1	5	36	38	18				
Dipl.-Kfm. (with/without edu A/Dr)	2	13	4	1	11	46	6	3				
Dipl.-Wirtsch.-Ing. (with/without Dipl.-Ing.)	2	1			2	16	2	2				1
MBA (with/without other edu)	1		2		1	8	5	3	11	3		3
Other education	1	3	2			2			1	1		

Table 7.8: Satisfaction with management education

Source: Developed by researcher

Table 7.9 lists the reasons of dissatisfaction with management education. Engineers complain about the lack of general and strategic management education: some suggest the inclusion of management education in the curricula of engineering faculties, a suggestion strongly supported by the researcher. However, some business economists and MBAs criticise the lack of praxis orientation or the lack of case study work and these comments indicate that management training in German universities and business schools should be rethought.

Education	Little, no education in general management	Little, no education in strategic management	Little, no praxis orientation; too theoretical	Lack of case study work	Lecturers lack of knowledge in strategic management
Technical education area A		1			1
Dipl.-Ing. (with/without edu A/Dr)	20	4	2		
Dipl.-Kfm. (with/without edu A/Dr)	1	1	6	1	
Dipl.-Wirtsch.-Ing. (with/without Dipl.-Ing.)					
MBA (with/without other edu)	2		1	1	
Other education					

Table 7.9: Reasons for dissatisfaction with management education

Source: Developed by researcher

A selection of comments on their university management education from respondents is listed as follows:

- Case 23, Technician: *“Lecturers were poorly trained and informed about modern management”*.
- Case 12, Dipl.-Ing.: *“No insights in general management and risks management”*.
- Case 36, Dipl.-Ing.: *“No management education und strategic management tools during engineering study at all. I expect management education during engineering study”*.
- Case 61, Dipl.-Ing.: *“Only education in engineering science; no introduction to management techniques”*.
- Case 119, Dipl.-Ing.: *“Too shallow, out of touch with reality”*.
- Case 128, Dipl.-Ing.: *“In engineering study, there was no management education at all”*.
- Case 159, Dipl.-Ing. Dr. Ing.: *“Too much engineering specific education; communication and leadership seem to be topics for self-study at the living organisation”*.

- Case 205, Dipl.-Ing. Dr. Ing.: *“Basic education in general management should also be for engineers”*.
- Case 220, Dipl.-Ing.: *“Hardly any management education in engineering study; students usually have little or not affinity to management”*.
- Case 220, Dipl.-Ing.: *“Missing offers for general and strategic management education”*.
- Case 15; Dipl.-Kfm.: *“Study included no preparation for leading a company; important management tools were not taught”*.
- Case 173, Dipl.-Kfm., MBA: *“Too little praxis and project orientation”*.
- Case 278; Dipl.-Kfm.: *“No practical examples or case studies; pure transfer of theory”*.

Summary of findings from this sub-section:

- Responding engineers are more dissatisfied with their university management education.
- Business economists and business engineers are more satisfied.
- Three MBAs are dissatisfied with their management education.
- Engineers complain about the lack of management education and suggest its inclusion in curricula.
- Seven business economists and two MBAs criticise the lack of praxis orientation or lack of case study work in management education.

Questions arising from this sub-section:

- Should improvements of management education at German universities (curricula and pedagogy) be suggested?
- Are there obstacles to include management education at engineering faculties?

7.5.5 Continuing education of respondents in strategic management

This sub-section answers research sub-question 1e: How much time do executives spend on continuing education regarding general and strategic management and which media is used to acquire knowledge?

Figure 7.13 depicts the number of training days executive have spent on continuing management education in the last five years. The average number of training days spent is 15.8 days (3.2 per year; 1.5% of the annual average working days). It ranges from 0 to 120 days. A number of 37 executives (14.1%) stated that they had no continuing education in general and strategic management all in the last five years.

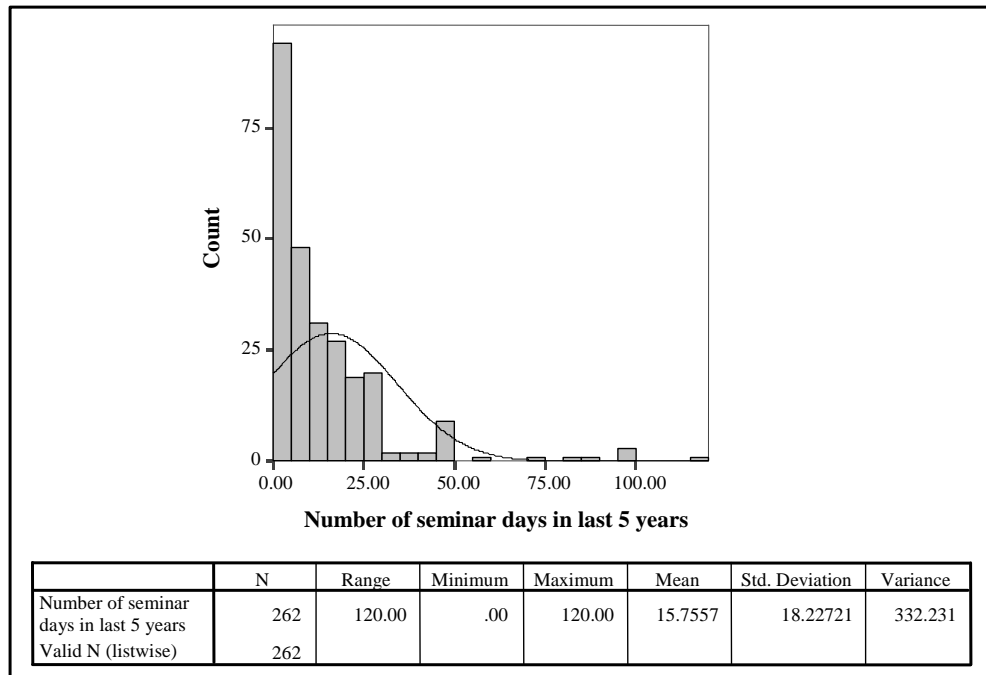


Figure 7.13: Number of seminars days spent in last 5 years

Source: Developed by researcher

Figure 7.13 shows the average number of training days executives have spent in the last 5 years for continuing management education by education types. MBAs have spent most time on continuing management training (21.3), followed by those with technical education in area A (20.9). Business economists have spent 16.1 and engineers 15.1 days on average on continuing management education. Business engineers have spent on average only 14 days in the last five years.

With the aid of the SPSS “compare means” modelling and the ANOVA table the relation of average numbers of training days with education type was evaluated. Although the bar chart shows different average numbers and suggests that engineers spend less on continuing management training, there is no significant statistical difference between the means of the groups (Sig. 0.196).

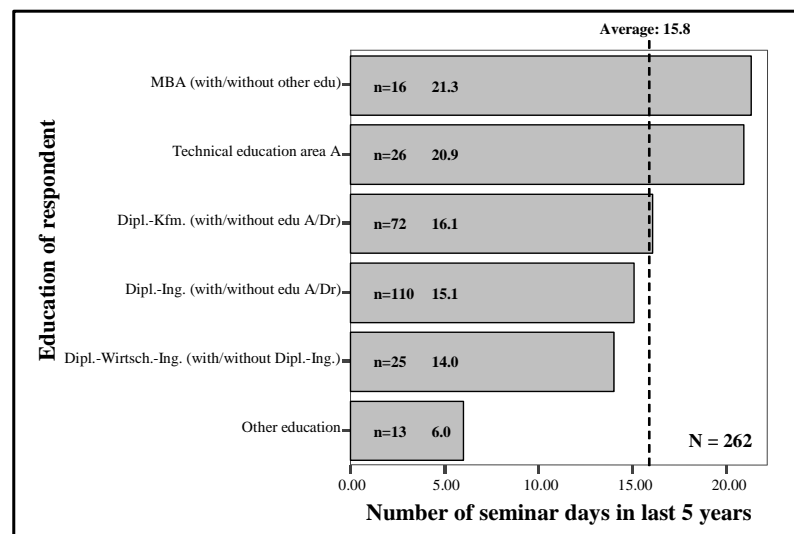


Figure 7.14: Average number of training days in different educations

Source: Developed by researcher

Figure 7.15 depicts the preference of continuing education in strategic management. Self-study by means of management literature (i.e. books and journals, cumulatively 35.2%) is most important, followed by seminars (24.6%). Many executives use exchange of experience with other companies to gather information and to train themselves (25.6%). For instance, the VDMA offers a variety of sessions of “Erfahrungsaustausch” (exchange of experience) to their members. The executives of the research sector use this platform for management training. Using training material downloaded from the internet (12.1%) is a new way of gaining material for self-study or of sharing information. Using external consultants for training on strategic management plays a minor role (0.7%).

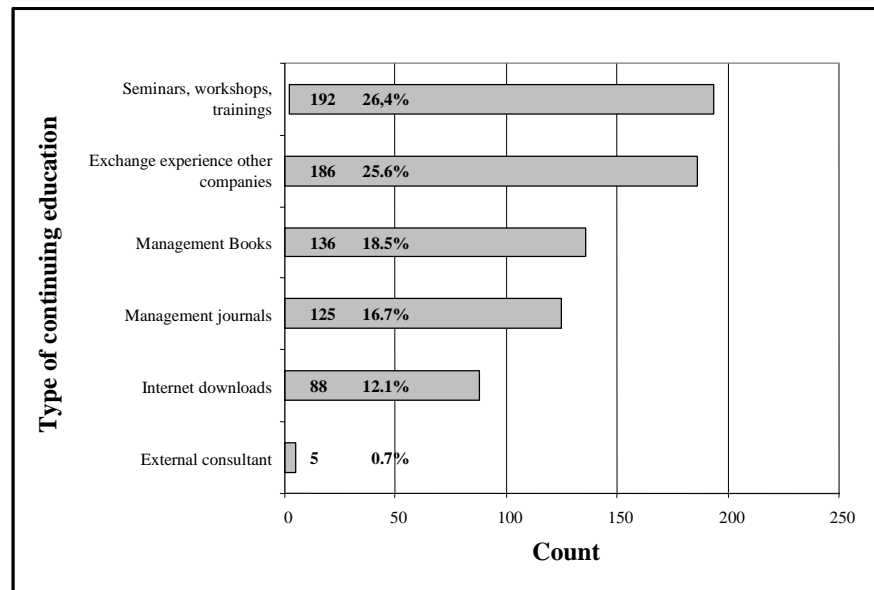


Figure 7.15: Preference of continuing education in strategic management

Source: Developed by researcher

Table 7.10 shows the type of continuing training in strategic management by education types. The relation of the type of continuing training with the type of education was evaluated via cross tabulation and Pearson chi-square test. The test did not reveal any significant relation (Sig. = 0.065 to 0.808). There is no preference of any education type for any type of continuing training.

Education	Seminars, workshops, trainings	Exchange experience with other companies	Management books	Management journals	Internet downloads	External consultant
Technical education area A	20	20	9	9	8	1
Dipl.-Ing. (with/without edu A/Dr)	80	75	52	53	34	2
Dipl.-Kfm. (with/without edu A/Dr)	52	49	38	36	25	1
Dipl.-Wirtsch.-Ing. (with/without Dipl.-Ing.)	21	20	18	14	11	
MBA (with/without other edu)	10	12	11	8	8	
Other education	9	10	8	5	2	1
Total	192	186	136	125	88	5

Table 7.10: Type of continuing management training by education types

Source: Developed by researcher

Summary of findings from this sub-section:

- The average number of training days spent in the last five years is 15.8 days.

- Executive prefer self-study, but also use seminars and exchange of experience for continuing management training.
- No relation between type of education and type of continuing training.

Question arising from this sub-section:

- How does continuing management training compare with other industry sectors?

This section has provided answers to research question 1 pertaining to the state of strategic management education of executives in the research sector. Evidence points to the lack of strategic management education at German universities and there is strong evidence that engineers have a deficit in strategic management knowledge as they have acquired most of their management knowledge in seminars or via self-study. Most of the responding engineers are dissatisfied with their management education at German universities and suggest inclusion of general and strategic management in the curricula. Executives in the research sector spent about three days per year on average on continuing management training.

The next section goes on to analyse and evaluate research data regarding the current practice of strategic management in the research sector.

7.6 The current practice of strategic management in the research sector

The following sections analyse and evaluate data from the SPSS data set regarding the application of strategic management tools of executives responding to the survey request and their perception of strategic management. Furthermore the approach, obstacles and planned improvements of strategic management in the responding companies are investigated. In addition, the challenges which the responding executives foresee for their company and the ways with which they cope with them are explored. This is intended to answer research question 2: What is the current practice in strategic management in the sector researched? as well as corresponding sub-questions.

7.6.1 Strategic management tools applied by executives

This sub-section answers research sub-question 2a: What strategic management tools are applied in praxis?

Table 7.11 lists the strategic management tools applied in the phases of strategic management by executives and companies in the research sector. The overall count of management tool elements of the responding population is 7,758. About 2,830 tool elements are applied (36.5%) and 4,925 tool elements are not applied (63.5%) on average by the executives and in the responding companies. The figures also indicate that the executives put less emphasis on strategy formulation tools.

See also figure Apx. 13 in the appendix section B.

Phase of strategic management		Strategic management tool	Yes, applied		No, not applied		Total	
			Count	%	Count	%	Count	%
Strategic analysis and assessment	Benchmarking	143	56.1%	112	43.9%	255	100.0%	
	SWOT	102	40.6%	149	59.4%	251	100.0%	
	Five competitive forces (Porter)	36	14.6%	211	85.4%	247	100.0%	
	Scenario technique	82	32.8%	168	67.2%	250	100.0%	
	Total strategic analysis and assessment	363	36.2%	640	63.8%	1003		
Strategic premises and settings	Vision	130	52.4%	118	47.6%	248	100.0%	
	Mission statement	76	30.8%	171	69.2%	247	100.0%	
	Corporate identity programme	166	65.9%	86	34.1%	252	100.0%	
	Total strategic premises and settings	372	49.8%	375	50.2%	747		
Strategy formulation	BCG growth-share matrix	63	25.3%	186	74.7%	249	100.0%	
	Attractiveness-business-strengths matrix	37	14.7%	214	85.3%	251	100.0%	
	Market-life-cycle-compet.-strength matr.	66	26.1%	187	73.9%	253	100.0%	
	Product market grid (Ansoff)	28	11.3%	220	88.7%	248	100.0%	
	Strategy maps	44	17.6%	206	82.4%	250	100.0%	
	Total strategy formulation	238	19.0%	1013	81.0%	1251		
Functional areas	Operations strategy	Quality management ISO 9000	206	80.5%	50	19.5%	256	100.0%
		TQM (total quality management)	98	38.9%	154	61.1%	252	100.0%
		EFQM model	11	4.4%	237	95.6%	248	100.0%
		Six sigma	28	11.3%	219	88.7%	247	100.0%
		Supply chain management	104	41.1%	149	58.9%	253	100.0%
		Total operations strategy	447	35.6%	809	64.4%	1256	
	HR strategy	Continuous improvement programme	199	78.7%	54	21.3%	253	100.0%
		Skill management	35	14.3%	210	85.7%	245	100.0%
		Change management	68	27.3%	181	72.7%	249	100.0%
		Total HR strategy	302	40.4%	445	59.6%	747	
	Marketing strategy	Market segment./different./position.	128	51.0%	123	49.0%	251	100.0%
		Marketing mix (Kotler, 4 Ps)	65	26.2%	183	73.8%	248	100.0%
		Key account management	148	58.5%	105	41.5%	253	100.0%
		Total marketing strategy	341	45.3%	411	54.7%	752	
	R&D strategy	Innovation management	126	50.2%	125	49.8%	251	100.0%
		Knowledge management	97	38.5%	155	61.5%	252	100.0%
		Total R&D strategy	223	44.3%	280	55.7%	503	
	Finance strategy	Overhead value analysis	138	55.2%	112	44.8%	250	100.0%
		Zero base budgeting	38	15.2%	212	84.8%	250	100.0%
		Total finance strategy	176	35.2%	324	64.8%	500	
		Total functional areas	1489	39.6%	2269	60.4%	3758	
Strategy execution and controlling	Activity database	63	25.3%	186	74.7%	249	100.0%	
	Balanced scorecards	57	22.8%	193	77.2%	250	100.0%	
	Risk management system	148	58.7%	104	41.3%	252	100.0%	
	Early warning system	103	41.5%	145	58.5%	248	100.0%	
	Total strategy execution and controlling	371	37.1%	628	62.9%	999		
Grand total		2,833	36.5%	4,925	63.5%	7,758		

Table 7.11: Strategic management tools applied

Source: Developed by researcher

Figure 7.16 visualises the percentages of strategic management tools applied, sorted by percentages. The picture is similar to that of the tools acquired by executives. Quality management is at the highest level. As already indicated, this stems from the fact that most German companies in the research sector are ISO 9001 certified. Other tools such as continuous improvement programme or risk management are also widely applied. Other tools such as EFQM, Ansoff's product-market grid, or six sigma are applied only in some companies. Knowledge of operative marketing is low as is reflected in the application rate (26.2%) for this important tool.

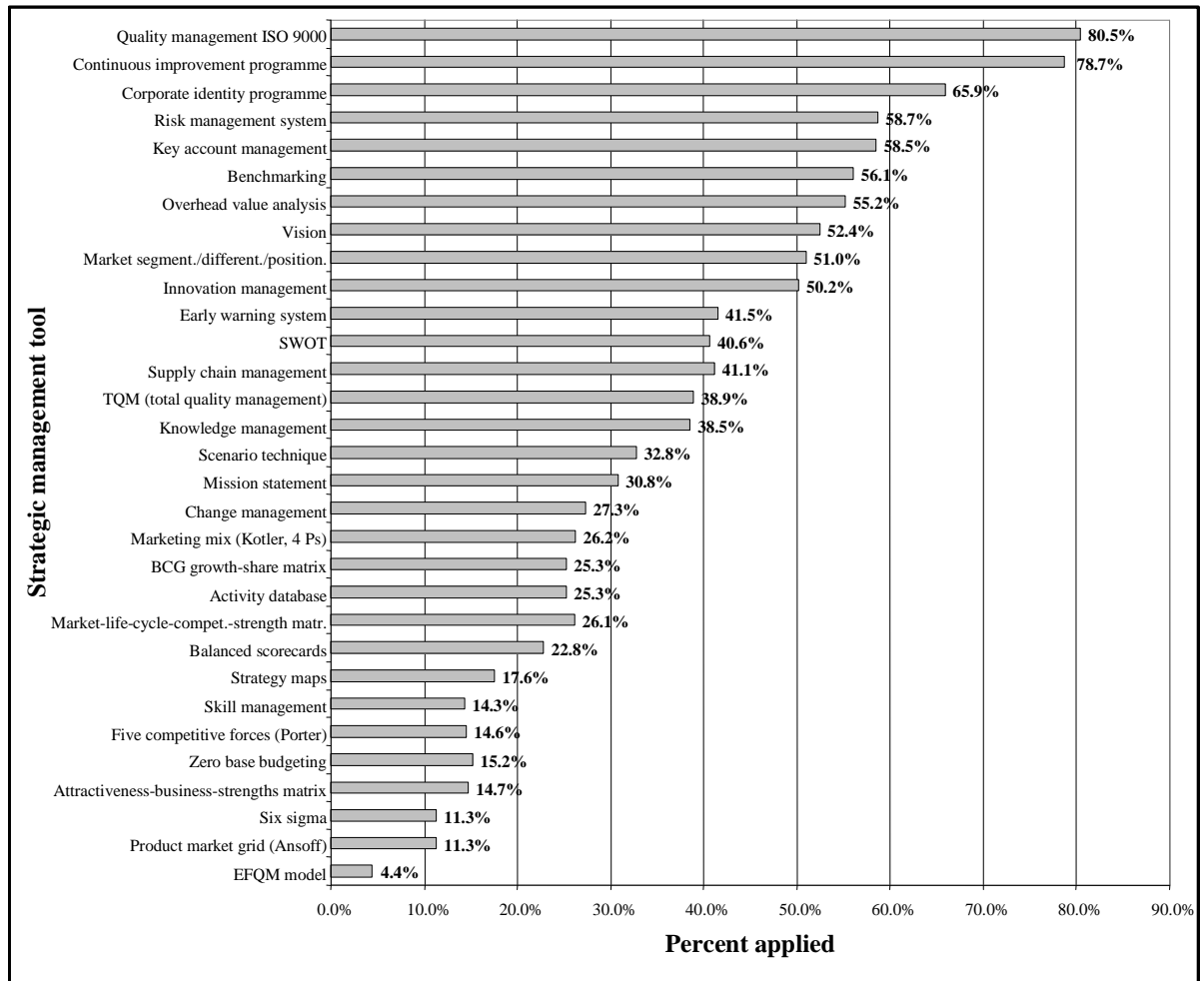


Figure 7.16: Strategic management tools applied (sorted by percent)

Source: Developed by researcher

A figure comparing strategic management tools acquired with those applied by the executive is listed in appendix B (Figure Apx. 13).

Figure 7.17 depicts the strategic management tool application rate which is a calculated variable. It is calculated by dividing the respondent's sum of applied strategic management tools by 31, the total number of tools. For this variable, only cases where the respondent is responsible for strategic management and those where the company applies strategic management are considered (210 cases). The average application rate is 36.6%. It ranges from 0% to 93.6%. The application rate appears low and is related to the lack of strategic management knowledge. No executive applies all 31 strategic management tools listed. The maximum number of tool application is 29.

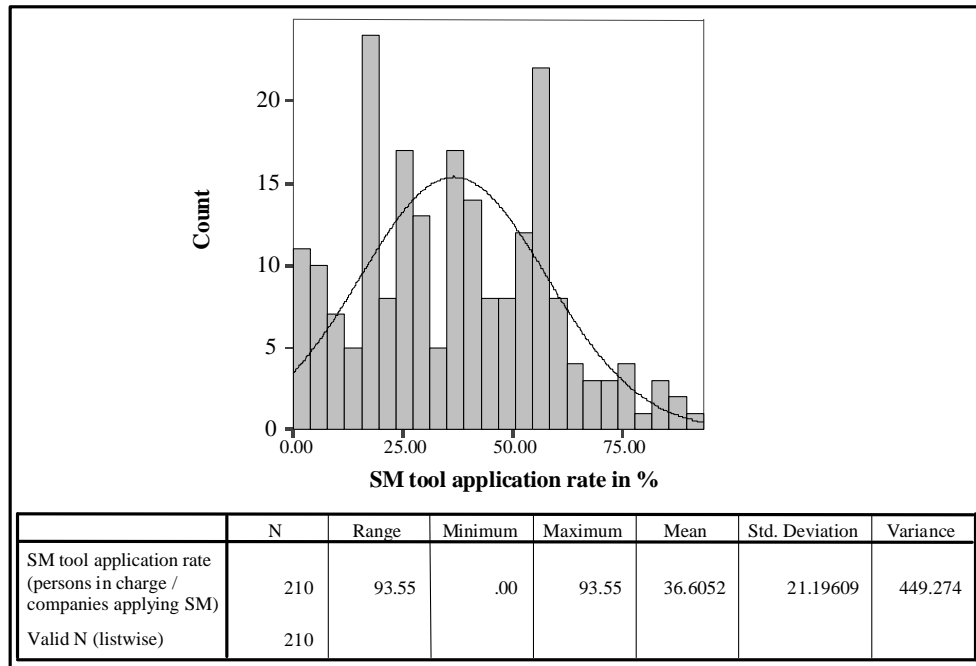


Figure 7.17: Strategic management tool application rate

Source: Developed by researcher

Figure 7.18 depicts the strategic management tool absorption rate. This variable is calculated by dividing the sum of acquired strategic management tools by the sum of applied tools. Only cases where the respondent is responsible for strategic management and those where the company applies strategic management are considered (210 cases). The average absorption rate is 66.6%. It ranges from 0% to 100%. Executives apply about two thirds of acquired strategic management knowledge. This raises the question of why executives do not apply more of their acquired management knowledge.

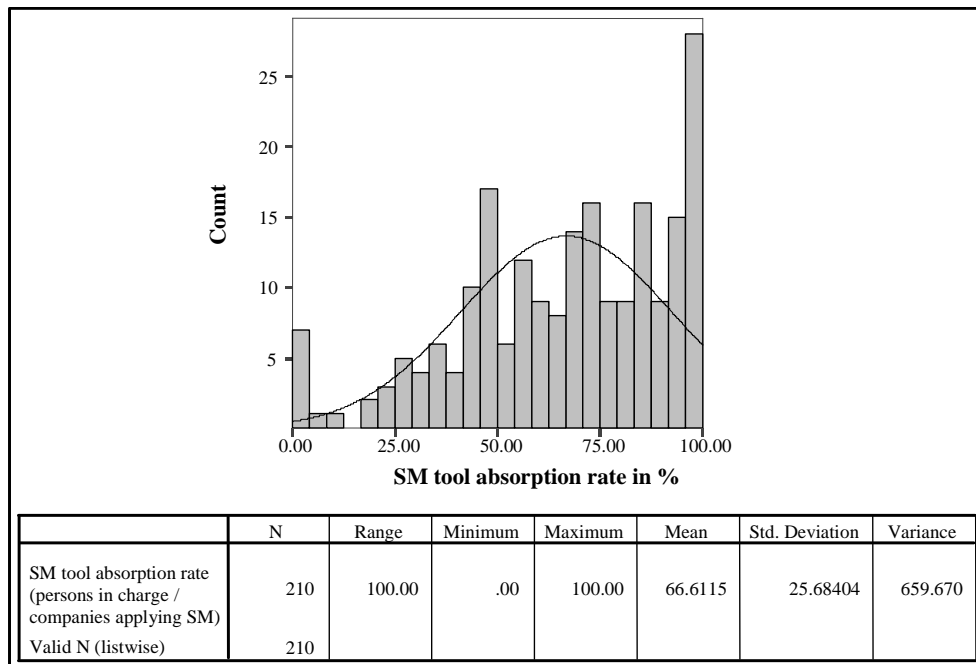


Figure 7.18: Strategic management tool absorption rate

Source: Developed by researcher

Summary of findings from this sub-section:

- On average, 36.6% of the strategic management tools are applied.
- The highest application rate is for quality management and the lowest for EFQM.
- Executives apply 66.6% of acquired strategic management knowledge.

Questions arising from this sub-section:

- Why do executives not apply more of their acquired management knowledge?
- How does this knowledge application profile compare to other industry sectors?

7.6.2 The relation of education with knowledge application

This section answers research sub-question 2b: What is the relation of the type of education with the application of strategic management?

The relation of the application of knowledge regarding the individual 31 strategic management tools with the type of education was evaluated via cross tabulation and Pearson chi-square test. Table 7.12 depicts the significance levels. For some of the tools, there is a significant statistical difference in the type of education and knowledge application of the strategic management tools is related to this. Looked at in detail, the difference for most of the tools with a high level of significance can be traced to the under-representation of engineers in the application of knowledge.

Strategic management tool	Level of significance Sig.
Benchmarking	0.019
SWOT	0.001
Five competitive forces (Porter)	0.001
Scenario technique	0.364
Vision	0.120
Mission statement	0.044
Corporate identity programme	0.057
BCG growth-share matrix	0.289
Attractiveness-business-strengths matrix	.0604
Market-life-cycle-compet.-strength matr.	0.087
Product market grid (Ansoff)	0.190
Strategy maps	0.185
Quality management ISO 9000	0.695
TQM (total quality management)	0.078
EFQM model	0.017
Six sigma	0.261
Supply chain management	0.094
Continuous improvement programme	0.060
Skill management	0.047
Change management	0.022
Market segment./different./position.	0.000
Marketing mix (Kotler, 4 Ps)	0.000
Key account management	0.060
Innovation management	0.571
Knowledge management	0.066
Overhead value analysis	0.874
Zero base budgeting	0.056
Activity database	0.873
Balanced scorecards	0.007
Risk management system	0.506
Early warning system	0.008

Table 7.12: Significance levels strategic management tools applied

Source: Developed by researcher

Table 7.13 shows data of four tools further analysed. The last column indicates the penetration of the type of education in the pertinent strategic management tool. The tool, Porter's five competitive forces, is hardly applied for strategic analysis by engineers (Sig. 0.001). As for the marketing mix, engineers use the tools market segmentation, differentiation and positioning less than those with another type of education (Sig. 0.000), but engineers are equally represented in the typical engineer's domains of quality management and innovation management.

Five competitive forces (Porter)			
Education type	Applied	Count	Penetration
Technical education area A	2	27	7.4%
Dipl.-Ing. (with/without edu A/Dr)	6	113	5.3%
Dipl.-Kfm. (with/without edu A/Dr)	12	73	16.4%
Dipl.-Wirtsch.-Ing. (with/without Dipl.-Ing.)	7	25	28.0%
MBA (with/without other edu)	6	17	35.3%
Other education	3	14	21.4%
Total	36	269	13.4%
Market segment./different./position.			
Education type	Applied	Count	Penetration
Technical education area A	10	27	37.0%
Dipl.-Ing. (with/without edu A/Dr)	38	113	33.6%
Dipl.-Kfm. (with/without edu A/Dr)	44	73	60.3%
Dipl.-Wirtsch.-Ing. (with/without Dipl.-Ing.)	17	25	68.0%
MBA (with/without other edu)	14	17	82.4%
Other education	5	14	35.7%
Total	128	269	47.6%
Quality management ISO 9000			
Education type	Acquired	Count	Penetration
Technical education area A	19	27	70.4%
Dipl.-Ing. (with/without edu A/Dr)	92	113	81.4%
Dipl.-Kfm. (with/without edu A/Dr)	53	73	72.6%
Dipl.-Wirtsch.-Ing. (with/without Dipl.-Ing.)	20	25	80.0%
MBA (with/without other edu)	13	17	76.5%
Other education	9	14	64.3%
Total	206	269	76.6%
Innovation management			
Education type	Acquired	Count	Penetration
Technical education area A	14	27	51.9%
Dipl.-Ing. (with/without edu A/Dr)	51	113	45.1%
Dipl.-Kfm. (with/without edu A/Dr)	33	73	45.2%
Dipl.-Wirtsch.-Ing. (with/without Dipl.-Ing.)	13	25	52.0%
MBA (with/without other edu)	11	17	64.7%
Other education	4	14	28.6%
Total	126	269	46.8%

Table 7.13: Application penetration of education types

Source: Developed by researcher

Figure 7.19 depicts the average strategic management application rate in percent of the different educational types, sorted by average application rate. Only cases where the respondent is responsible for strategic management and those where the company applies strategic management are considered (210 cases). The average application rate is 36.6%. MBAs reach the highest application rate at 47.1% followed by business engineers (41.0%) and business economists (40.7%). Engineers, and those with another kind of technical education, show the lowest rates of 32.7% and 30.8% respectively. This is evidence of the lack of strategic management application: it points to the issue of the engineers' lack of strategic management knowledge evaluated above.

With the aid of the SPSS "compare means" modelling and the ANOVA table, the relation of the strategic management tool application rate with the type of education was evaluated. The differences between the groups are statistically significant (Sig. 0.015). Thus, the

average strategic management tool application rate is related to and dependent upon the type of education.

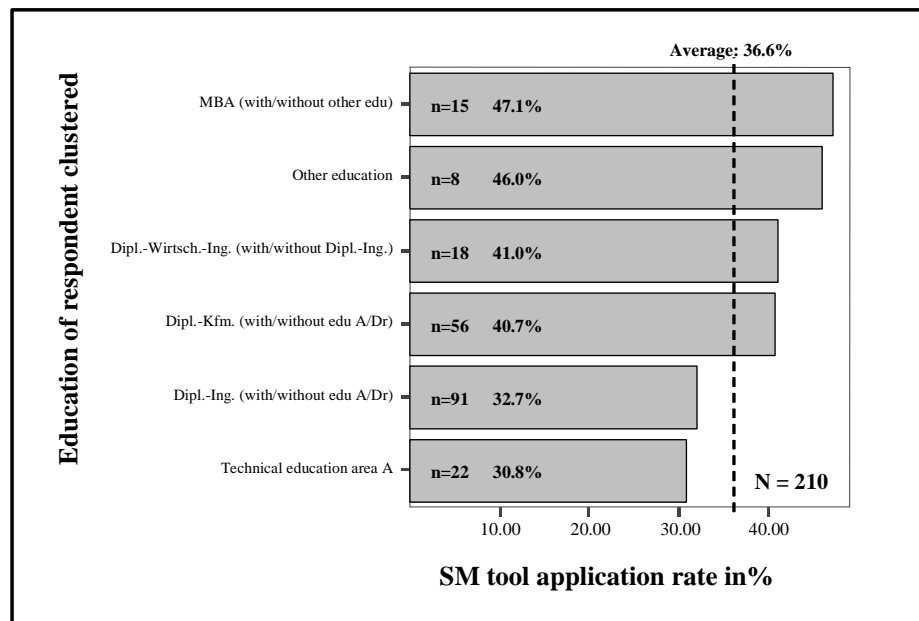


Figure 7.19: Average SM tool application rate of education types

Source: Developed by researcher

Figure 7.20 depicts the average strategic management absorption rate in percent of the different clustered educational types, sorted by average absorption rate. Only cases where the respondent is responsible for strategic management and those where the company applies strategic management are considered (210 cases). Those with technical education, other than engineers and engineers themselves reach the highest level of 75.6% and 69.7%. MBAs and business economists show the lowest level of 59.1% respectively 58.7%. Those with other technical education and engineers seem to be more inclined to apply acquired knowledge in praxis.

With the aid of the SPSS “compare means” modelling and the ANOVA table the relation of the strategic management tool absorption rate with the type of education was evaluated. The differences between the groups are statistically significant (Sig. 0.022). Thus, the average strategic management tool absorption rate is related to and dependent upon the type of education.

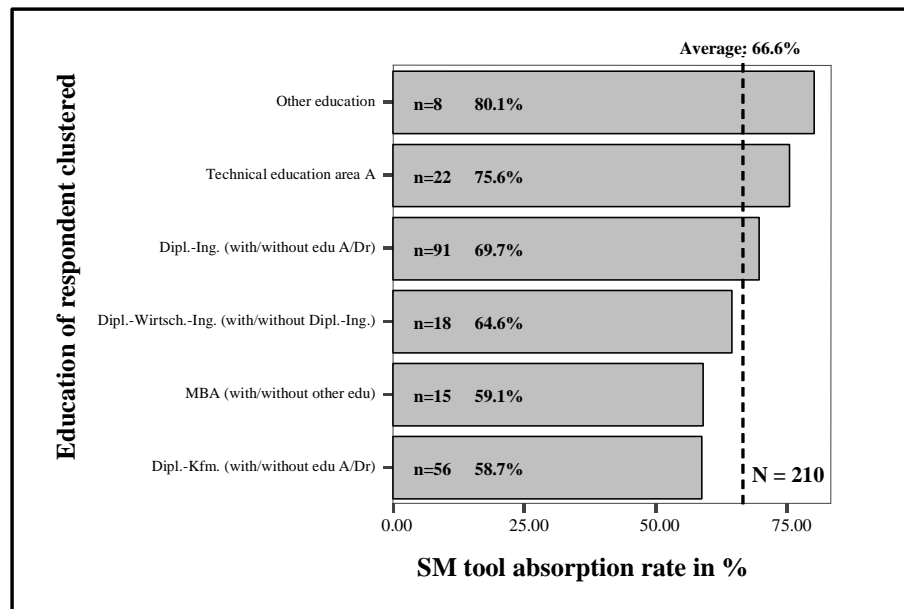


Figure 7.20: Average SM tool absorption rate of education types

Source: Developed by researcher

Table 7.14 depicts a cross tabulation of the respondents' education and whether the strategic planning process is carried out in the company they lead. Engineers seem to be less inclined to apply the strategic planning process compared to business economists, business engineers and MBAs. (About 10% of the engineers in executive positions do not apply the strategic management process). However, the Pearson chi square test revealed no significant difference between the types of education (SIG. 0.394).

Crosstabulation								
		Technical education area A	Dipl.-Ing. (with/without edu A/Dr.)	Dipl.-Kfm. (with/without edu A/Dr.)	Dipl.-Wirtsch.-Ing. (with/without Dipl.-Ing.)	MBA (with/without other edu)	Other education	Total
Strategic planning yes or no	Yes	26	102	69	23	16	11	247
	No	1	11	4	2	1	3	22
Total	Total	27	113	73	25	17	14	269
	% No	3.70%	9.73%	5.48%	8.00%	5.88%	21.43%	8.18%

Table 7.14: Cross tabulation education and strategic planning

Source: Developed by researcher

Summary of findings from this sub-section:

- Application of strategic management tools is related to the type of education.
- Significant differences are the result of under-representation of engineers in the application of certain strategic management tools.
- There is lack of application of marketing tools by engineers.
- Quality management and innovation management, a typical engineer's domains, show high application penetration for engineers.
- The strategic management tool absorption rate is related to the type of education.

- Engineers absorb a higher rate of strategic management tools (69.7%) compared to business economists (58.7%).
- Companies led by engineers and not applying strategic planning (9.7%) are above average (8.2%).

7.6.3 The approach to strategic management

This section answers research sub-question 2c: What is the approach to strategic management in responding companies?

In the responding population of 269 companies, 222 (82.5%) executives stated that they are in charge of strategic management, 39 (14.5%), are not in charge and 14 (5.2%) respondents stated that the company does not apply strategic management at all.

Figure 7.21 depicts who is responsible for strategic management in the responding companies. In about 86% of companies, the managing partner, or managing director, is responsible for carrying out strategic management. In about 5% of the responding companies, a management team is in charge of strategic management. Other managing positions play a minor role.

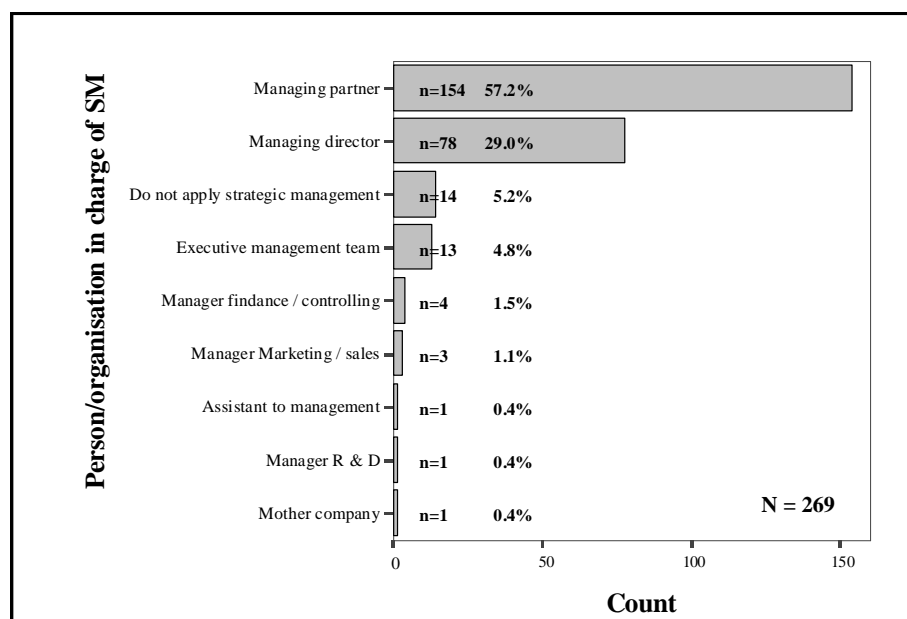


Figure 7.21: Person or organisation in charge of strategic management

Source: Developed by researcher

As depicted in Figure 7.22, on average, the strategic planning process was introduced to companies in the machinery and equipment sector in 1998. That is about ten years before this research survey was carried out. As strategic management tools were introduced by management scientists at the end of the 1950s, this is quite late.

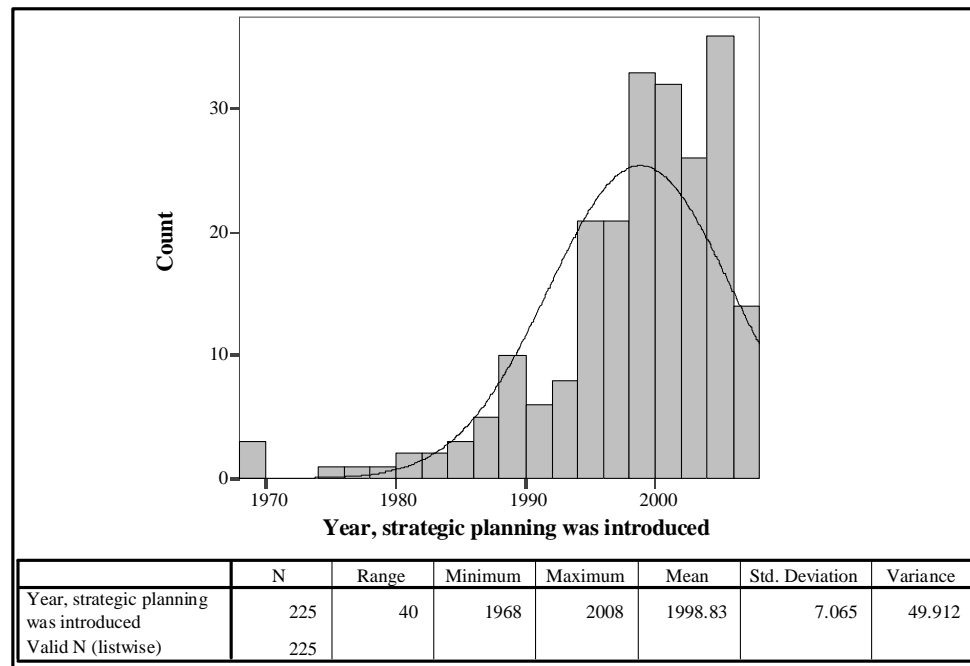


Figure 7.22: Year of introduction of strategic planning

Source: Developed by researcher

Figure 7.23 depicts the approach of responding companies to the strategic planning process. Most of the companies (42.0%) carry out strategic planning annually in combination with the operative planning. A number of 90 companies (33.5%) say they perform strategic planning annually and on demand. About 12% of the responding companies do strategic planning on demand only and about 4.5% once in a while. About 8% of the responding companies say they do not do strategic planning at all. Thus over 92% of the responding companies claim to do strategic planning. This is more than expected by the researcher. However, this raises the question about the quality of the strategic planning process.

A sample of cases are listed, as follows, to support the concerns about the quality of the strategic planning process in some companies:

- Case 9, Dipl.-Ing., managing director, applies no management tools, turnover € 5.3 million, strategic planning once in a while, perception of strategic management: *"Sales planning, personnel planning, productivity planning"*.
- Case 24, Dipl.-Ing., managing partner, applies 4 management tools, turnover € 5.4 million, strategic planning once in a while, perception of strategic management: *"Set and follow up objectives"*.
- Case 214, Dipl.-Ing., managing partner, applies 6 management tools, turnover € 4.1 million, perception of strategic management: *"Prepare plans and realise"*.

The cases above also provide evidence that some executives mix up operative planning with strategic planning.

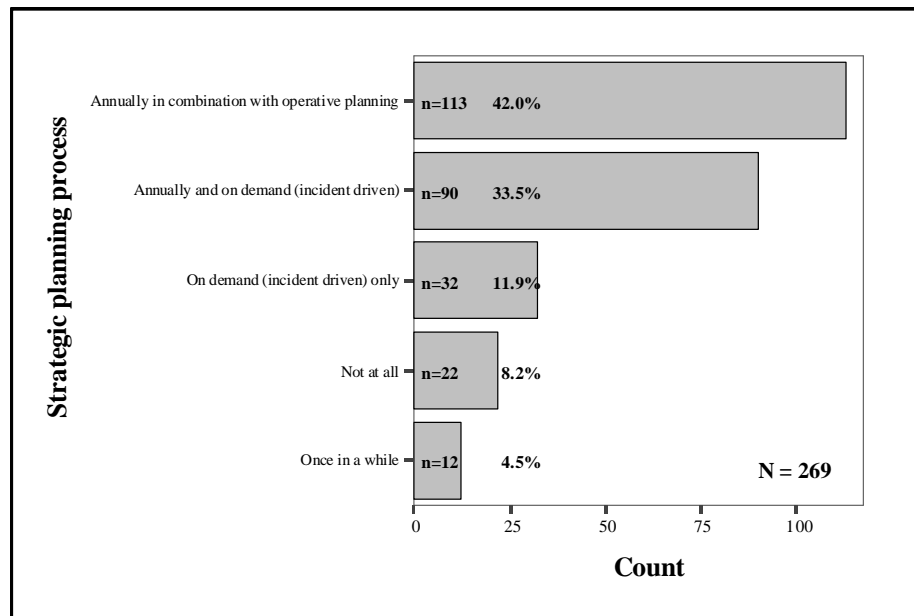


Figure 7.23: Strategic planning process of responding companies

Source: Developed by researcher

Figure 7.24 depicts how responding companies execute their strategic plan. About 55% of the responding companies mentioned that they use their normal management meetings to follow up on activities from the strategic plan, while about 42% use special strategy meetings. Around 43% of the responding companies have a top down system of objectives in place. Key figure tables are used in 27.5% of the companies. The other options, such as the balanced scorecard or external consultants, play a minor role in the execution of strategic plans. Companies in the research sector tend to execute their strategic plan with established procedures.

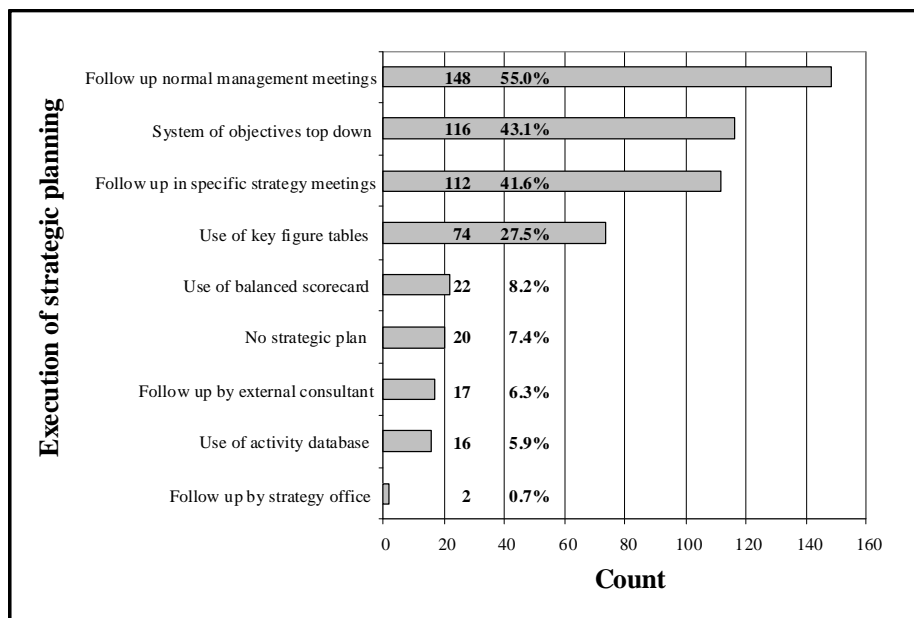


Figure 7.24: Execution of strategic plan

Source: Developed by researcher

Figure 7.25 shows how responding companies communicate the strategic plan or its important elements. About 43% of the companies communicate to all employees, around

40% to those in managing positions and 14.5% to the top management only. Major creditors (36.7%) and equity owners (24.2%) are also informed about important elements of the strategic plan. Other stakeholders, such as major customers (19.7%), suppliers (10.4%) and partner companies (5.9%) are informed as well. Companies in the research sector tend to keep information about the strategic plan or its important elements to the management level (53.2%).

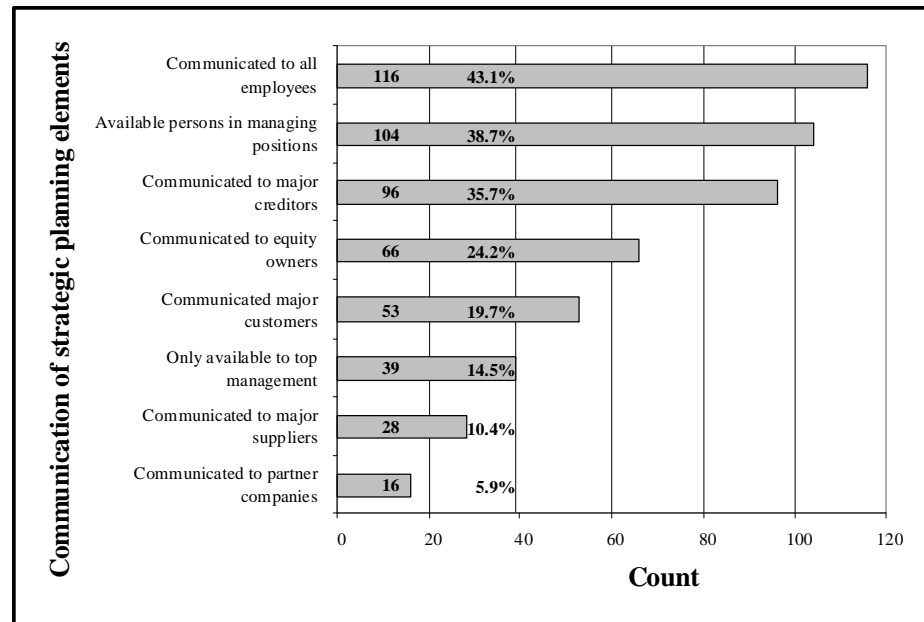


Figure 7.25: Communication of strategic planning elements

Source: Developed by researcher

Summary of findings from this sub-section:

- Managing partners or managing directors are responsible for carrying out strategic management (86%). Management teams play a minor role.
- Strategic planning process introduced on average, in 1998.
- Over 92% of the responding companies claim to do strategic planning.
- There is evidence that some executives mix up operative planning with strategic planning.
- Companies tend to execute their strategic plan with established procedures; the balanced scorecard plays a minor role.
- Companies tend to keep information about the strategic plan or its important elements to the management level.

Question arising from this sub-section:

- What is the strategic management situation in other German industry sectors?
- What is the quality level of the strategic planning process in German SMEs?

7.6.4 Motives and obstacles to the strategic planning process

This section answers research sub-question 2d: What are the motives and obstacles to

strategic planning process?

Figure 7.26 depicts the motives of respondents in the application of strategic planning. Most executives (86.2%) plan strategically, because they feel it is important for the future success of the company. Nevertheless, external motives play an important role: a strategic plan may be required from banks who finance the company (16.4%) or from the owner (12.6%) or from the parent company (11.9%). About 5% of companies apply strategic planning because an external consultant recommends it. It is interesting that over 16% of the companies in the research sector are explicitly asked by their bank to prepare a strategic plan. It seems that, in some cases, the bankers lending money are more convinced of the benefits of strategic planning than the executive who is responsible for the company.

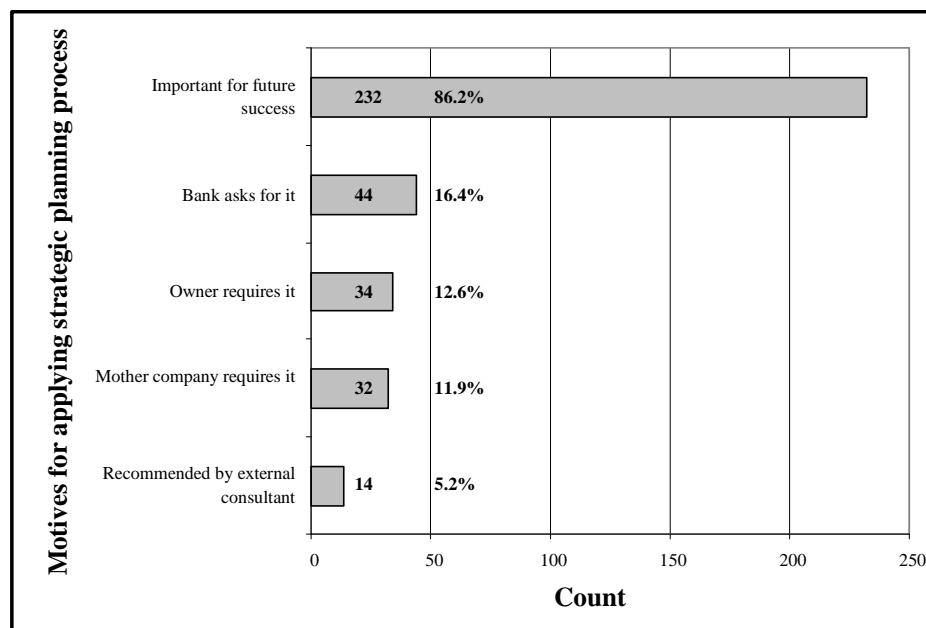


Figure 7.26: Motives for applying strategic planning process

Source: Developed by researcher

Figure 7.27 gives information on the barriers to the strategic planning process which 58 executive respondents consider exist in their individual companies. Time constraints are mentioned by 8.6% of the respondents and lack of resources by 5.6% of the others. 6.7% think the strategic planning process is too theoretical, while 3.3% think it is too complex. Twelve executives do not think that strategic planning is at all necessary for the management of their companies. Cost constraints play a minor role. One could argue that lack of time is insufficient excuse for neglecting strategic planning. Nevertheless, if strategic planning, the core element of strategic management is criticised as being too theoretical and too complex, this criticism should be considered by academics developing and communicating strategic management tools.

The value of strategic management is questioned by three respondents:

- Case 77, Dipl.-Ing., managing partner, perception of strategic management: “*SM is a term not defined in the company but practiced; most of the decisions and actions in the company will be derived from the necessities of the normal workday; with a number of 42 employees academically described SM is normally not necessary*”.

- Case 141, Dipl.-Ing., Dr. Ing., managing partner, perception of strategic management: *“Until today I ask myself what it is! An open word from an engineer coined by natural science, for me it is an empty cliché! Sorry”*.
- Case 217, Dipl.-Kfm., financial manager commenting on strategic management tools: *“Too many English terms in strategic management; not praxis orientated, something for large companies”*.

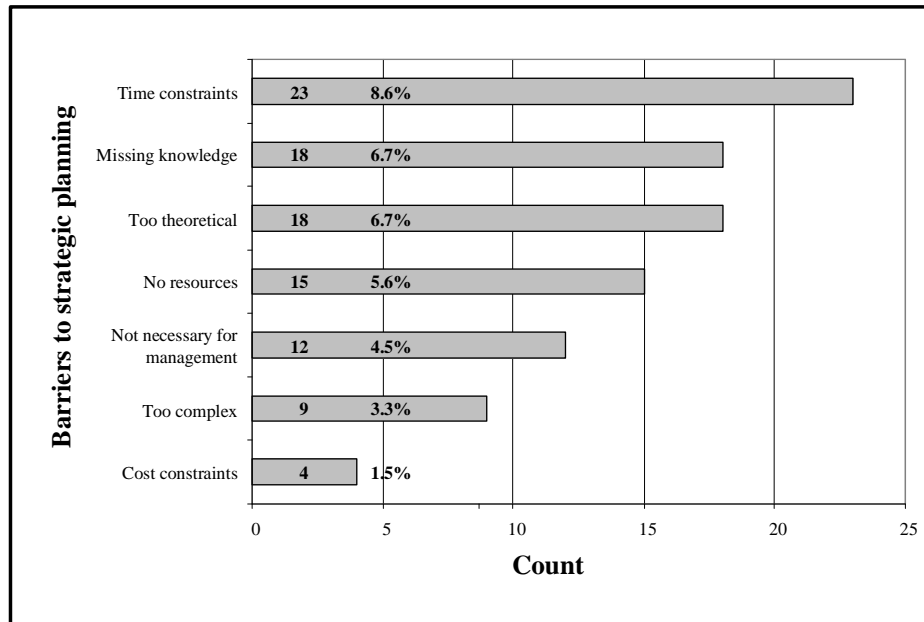


Figure 7.27: Barriers to strategic planning

Source: Developed by researcher

Summary of findings from this sub-section:

- 86.2% of the executives apply strategic planning because they feel it is important for the future success of the company.
- 16% of the companies are asked by their bank to prepare a strategic plan.
- Time constraints (8.6%) and lack of knowledge (6.7%) are major barriers to strategic planning.
- The strategic planning process is considered as too theoretical (6.7%) and too complex (3.7%).

Questions arising from this sub-section:

- Should the findings above be considered by academics developing and communicating strategic management tools?
- How can strategic management and in particular the strategic planning process and the pertinent tools be made less complex and more attractive and user friendly for SME executives?

7.6.5 How organisations improve strategic management

This section answers research sub-question 2e: What are the organisations and individuals

doing to improve strategic management in their company?

Figure 7.28 depicts how companies and executives keep the knowledge about strategic management up to date or improve it. Most of the executives (60.6%) consider seminars, workshops, or training. Exchange of experience (50.2%) also plays an important role. As already mentioned in section 7.5.5, companies in the machinery and equipment sector use VDMA offers for exchange of experience and information. About 32% of the companies purchase management literature for self-study. The engagement of external consultants is mentioned by about 20% of the respondents. About 10% of the companies plan to assign a team for strategic management and around 8% will assign a budget. A strategy office is only planned by one company. However, 19% of the executives see no reason to improve the strategic management in their company. Compared to strategy execution, external consultants play a more important role regarding improvement of strategic management.

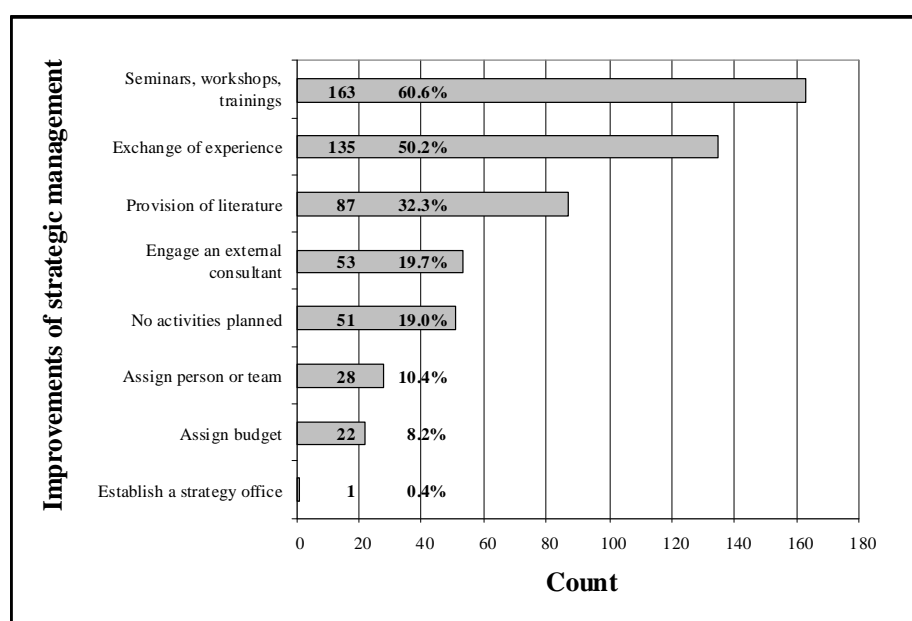


Figure 7.28: Measures to improve strategic management

Source: Developed by researcher

Summary of findings from this sub-section:

- 81.0% of responding companies are taking steps to improve strategic management practice.
- Seminars, workshops, or trainings (60.6%) as well as the exchange of experience (50.2%) are most important sources for improving strategic management.
- 19.7% of companies engage external consultants for the improvement of strategic management.

7.6.6 Perception of respondents of strategic management

This section answers research sub-question 2f: What is the perception or understanding of the executives regarding strategic management?

The statements of the respondents regarding their perception of strategic management

were translated and coded according to a list of strategic management clusters and elements (Table 7.15). In total, 195 (72.5%) statements of executives were received and 564 response elements were coded and added to the list. 74 (27.5%) respondents did not state anything regarding their perception of strategic management.

All strategic management clusters were considered by the responding population. The most counted element of strategic management is strategic behaviour (90) with statement such as “strategic alignment; strategic planning; secure company; secure success; future orientation; realise potentials; develop company” followed by setting objectives (83) and strategy execution (62). Some important elements of strategic management such as scenario technique, internationalisation, ecology, market segmentation, price mix, or strategic controlling and governance were not mentioned at all. The early warning system, with one count, is also neglected.

Three managing partners (two engineers, one business engineer) stated that they do not know what strategic management is and another three (two engineers, one industrial clerk) do not see the necessity for strategic management.

In the following some statements regarding perception of strategic management are listed:

- Case 5, Dipl.-Ing.: *“Strategic alignment of company for next 3 to 5 years with determination of objectives which are at least annually reviewed and if necessary adapted to new premises and developments”.*
- Case 127, Dipl.-Ing.: *“Knowledge of own strengths and weaknesses best possible positioning in the market; identify and realise continuously internal and external development potentials; enable via portfolio analysis the operative and strategic management of the company; secure and improve the competitive position by innovation potentials through internal and external cooperation”.*
- Case 161, industrial clerk: “empty cliché”.
- Case 223, Dipl.-Ing., MBA: *“SM is now that what the boss made in the past with his gut feeling. He let the sum of information result in decisions. Today information is more structured by strategic management, but there is a lack of gut feeling. That is the reason why there are no more real decision makers”.*
- Case 240 Dipl.-Wirtsch.-Ing.: *“Strategic management includes the analysis and strategy development to lead a company in a dynamic changing internal and external world. SM includes strategic acting with respect to all tasks and policies in the company to secure the status quo, success and the positive further development”.*

The statement in case 223 is remarkable. The respondent raises the issue of “gut feeling” versus structured strategic management. One could argue that both should not exclude each other. Too much “gut feeling”, for example, may risk neglecting trends in the market that have been identified through a structured market analysis. On the other hand, over-organised and over-structured processes may blind creativity, intuition, courage and sixth

sense. It is worth examining the issue of “gut feeling” versus structured strategic management in more detail.

Area of strategic management			Tool	Code	Perception count	Perception %	Perception count cluster	Perception % cluster
Strategic management	Strategic thinking & behaviour	Strategic thinking	Strategic mind set, holistic thinking, entrepreneurial thinking, anticipated thinking, common sense, courage	1	23	4.1%	23	3.9%
		Strategic behaviour	Strategic alignment, strategic planning, secure company, secure success, future orientation, realise potentials, develop company	2	90	16.0%	90	16.1%
	Area of strategic planning process	Strategic analysis and assessment	External environment	10	39	6.9%	39	6.9%
			Globalisation	10.1				
			Real estate / bank / financial crisis	10.2				
			Business cycles, recession, depression	10.3				
			Currency exchange rates	10.4				
			Competition from Asia, low wage countries	10.5				
			Competitive pressure, price pressure	10.6				
			Market development, trends	10.7				
		Internal environment	SWOT	12	9	1.6%	26	4.4%
			Scenario technique	13	0	0.0%		
			Vision	20	20	3.5%		
		Strategic premises and settings	Mission	21	4	0.7%	114	20.6%
			Objectives	22	83	14.7%		
			Corporate identity programme	23	0	0.0%		
		Strategy formulation	Values, social responsibility, policies, philosophy, culture	24	7	1.2%	31	6.0%
			Strategic direction, key success factors, key competences	30	4	0.7%		
			Portfolio techniques	31	4	0.7%		
			Market penetration	32	1	0.2%		
			Market development	33	5	0.9%		
			Product development	34	10	1.8%		
			Diversification	35	1	0.2%		
			Growth strategies; internal, external	36	4	0.7%		
			Internationalisation marketing, production sites, procurement	37	0	0.0%		
			Integration strategies	38	0	0.0%		
			Strategic alliances, partnerships	39	2	0.4%		
		Operations strategy	Organisational structure, management of change, turn around	40	14	2.5%	64	11.6%
			Business processes, EDP, project management	41	4	0.7%		
			Quality management	42	1	0.2%		
			Ecology	43	0	0.0%		
			Supply chain management	44	1	0.2%		
			Outsourcing	45	0	0.0%		
			Production transfer	46	0	0.0%		
			Equipment, production capacity, investments, infrastructure	47	3	0.5%		
			Operative planning and management	48	41	7.3%		
			Procurement, availability of goods, suppliers	49	0	0.0%		
		HR strategy	Leadership, delegation, motivation, information	50	9	1.6%	15	2.5%
			HR marketing	51	0	0.0%		
			HR planning, recruiting	52	4	0.7%		
			HR development, employee qualification	53	2	0.4%		
			HR target agreement, assessment, remuneration	54	0	0.0%		
		Marketing strategy	Suggestions, continuous improvement	55	0	0.0%	61	10.7%
			Segmentation, market niches	60	0	0.0%		
			Positioning, branding	61	11	2.0%		
			Differentiation	62	5	0.9%		
			Market research	63	25	4.4%		
			Product mix	64	4	0.7%		
			Price mix	65	0	0.0%		
			Promotion, sales	66	8	1.4%		
			Distribution	67	0	0.0%		
			Marketing	68	5	0.9%		
		R&D strategy	Customer satisfaction, loyalty, value, support	69	3	0.5%	4	0.7%
			R&D progr., technological leadership, new technology, innovation	70	4	0.7%		
			Innovation management	71	0	0.0%		
		Finance strategy	Creativity, knowledge management, learning organisation	72	0	0.0%	11	1.8%
			Financing, equity, financial resources, financial planning	80	3	0.5%		
			Financial planning, budgeting	81	2	0.4%		
			Cost management, cost development	82	3	0.5%		
			Productivity improvement	83	1	0.2%		
			Liquidity management	84	0	0.0%		
			Profitability management	85	2	0.4%		
	Strategy execution & controlling	Strategy execution, operative and strategic controlling, early warning	Activity database, realise; follow up, take action	90	62	11.0%	86	14.9%
			Key performance indicators, balanced scorecard	91	2	0.4%		
			Operative controlling	92	13	2.3%		
			Strategic controlling; reiteration of SP, governance, auditing	93	0	0.0%		
			Risk management	94	8	1.4%		
			Early warning system	95	1	0.2%		
			No answer; no challenge seen; no measures required	100	74	13.1%		
			Do not know	101	3	0.5%		
			Strategic management / planning not necessary	102	3	0.5%	3	

Table 7.15: Perception of respondents of strategic management

Source: Developed by researcher

Summary of findings from this sub-section:

- 72.5% of the respondents provided a statement on their perception of strategic management.
- Three managing partners (two engineers, one business engineer) stated that they do not know what strategic management is.
- Three managing partners (two engineers, one industrial clerk) do not see the necessity for strategic management.
- Some executives mix up operative planning with strategic planning (see also 7.6.3).
- Most counted elements are strategic behaviour, objectives and strategy execution.
- Key elements such as scenario technique, internationalisation, ecology, market segmentation, price mix, or strategic controlling, governance and early warning are hardly mentioned.

Question arising from this sub-section:

- Should the issue of “gut feeling” versus structured strategic management be examined more closely?

7.6.7 Challenges executives see and how they cope with them

This section answers research sub-question 2g: What kind of challenges do the executives see ahead and how do they cope with them?

The statements of the respondents regarding the major challenges they see for the company within the next two years were translated and coded according to list of strategic management clusters and elements (Table 7.16). In total 203 (75.5%) statements of executives were received and 411 response elements were coded and added to the list. A number of 66 (24.5%) respondents have not stated anything regarding challenges ahead.

Most of the responding companies see the challenges ahead in the external environment (37.3%). The responses are interesting with regard to the financial crisis (41) that became evident during the data collection period. As the real estate crises in the USA escalated, followed by the bank crises, Lehman Brothers went bankrupt. Subsequently, a worldwide financial and economic meltdown began and more respondent companies realised this would be the major challenge ahead. In January 2008, there were many signals of future crisis (Wirtschaftswoche, 2008). While some companies were still preoccupied with the challenges of hiring qualified personnel, their order entry was starting to collapse. This can be traced to the lack of consequent environmental observation and an early warning system.

Other strategic elements the executive see as challenges, are product development (18), company growth (29), planning and recruiting qualified personnel (20), promotion and sales (17) and the development of costs (20). Financial resources and equity play a minor role (9). In the course of the world-wide crisis continuing in 2009, this very likely has

changed.

In the following some statements regarding major challenges ahead are listed:

- Case 8, Dipl.-Ing., Dr. Ing.: *“Strong globalisation process, competitors from Asia”*.
- Case 64, Dipl.-Ing.: *“Availability of qualified personnel, especially engineers”*.
- Case 176, Dipl.-Ing., MBA: *“Increasing costs (especially wages); economic situation/recession; volatile market environment, high raw material prices, unfavourable exchange rates”*.
- Case 210, Dipl.-Wirtsch.-Ing.: *“Economic situation with reduction of GNP, especially in automotive area strong reduction; survive 2009/10 at 30% less turnover compared to 2008”*.
- Case 250, Dipl.-Kfm.: *“Survive the worldwide economic crisis; secure and expand sales markets; reduce capacity in order to secure liquidity”*.

Area of strategic management			Tool	Code	Challenge count	Challenge %	Perception count cluster	Challenge % cluster
Strategic management	Strategic thinking & behaviour	Strategic thinking	Strategic mind set, holistic thinking, entrepreneurial thinking, anticipated thinking, common sense, courage	1	1	0.2%	1	0.2%
		Strategic behaviour	Strategic alignment, strategic planning, secure company, secure success, future orientation, realise potentials, develop company	2	6	1.5%	6	1.4%
	Area of strategic planning process	Strategic analysis and assessment	External environment	10	0	0.0%	151	37.3%
			Globalisation	10.1	6	1.5%		
			Real estate / bank / financial crisis	10.2	41	10.0%		
			Business cycles, recession, depression	10.3	46	11.2%		
			Currency exchange rates	10.4	4	1.0%		
			Competition from Asia, low wage countries	10.5	8	1.9%		
			Competitive pressure, price pressure	10.6	9	2.2%		
			Market development, trends	10.7	37	9.0%		
			Internal environment	11	1	0.2%	1	0.2%
			SWOT	12	0	0.0%		
		Strategic premises and settings	Scenario technique	13	0	0.0%	2	0.9%
			Vision	20	0	0.0%		
			Mission	21	0	0.0%		
			Objectives	22	0	0.0%		
			Corporate identity programme	23	2	0.5%		
		Strategy formulation	Values, social responsibility, policies, philosophy, culture	24	0	0.0%	73	17.5%
			Strategic direction, key success factors, key competences	30	1	0.2%		
			Portfolio techniques	31	3	0.7%		
			Market penetration	32	4	1.0%		
			Market development	33	6	1.5%		
			Product development	34	18	4.4%		
			Diversification	35	1	0.2%		
			Growth strategies; internal, external	36	29	7.1%		
			Internationalisation marketing, production sites, procurement	37	10	2.4%		
			Integration strategies	38	0	0.0%		
		Operations strategy	Strategic alliances, partnerships	39	1	0.2%	50	11.8%
			Organisational structure, management of change, turn around	40	9	2.2%		
			Business processes, EDP, project management	41	7	1.7%		
			Quality management	42	7	1.7%		
			Ecology	43	5	1.2%		
			Supply chain management	44	3	0.7%		
			Outsourcing	45	1	0.2%		
			Production transfer	46	1	0.2%		
			Equipment, production capacity, investments, infrastructure	47	14	3.4%		
			Operative planning and management	48	0	0.0%		
		HR strategy	Procurement, availability of goods, suppliers	49	3	0.7%	28	6.8%
			Leadership, delegation, motivation, information	50	1	0.2%		
			HR marketing	51	1	0.2%		
			HR planning, recruiting	52	20	4.9%		
			HR development, employee qualification	53	6	1.5%		
		Marketing strategy	HR target agreement, assessment, remuneration	54	0	0.0%	35	8.9%
			Suggestions, continuous improvement	55	0	0.0%		
			Segmentation, market niches	60	0	0.0%		
			Positioning, branding	61	2	0.5%		
			Differentiation	62	2	0.5%		
			Market research	63	0	0.0%		
			Product mix	64	5	1.2%		
			Price mix	65	0	0.0%		
			Promotion, sales	66	17	4.1%		
			Distribution	67	0	0.0%		
		R&D strategy	Marketing	68	3	0.7%	17	3.9%
			Customer satisfaction, loyalty, value, support	69	6	1.5%		
			R&D progr., technological leadership, new technology, innovation	70	8	1.9%		
			Innovation management	71	6	1.5%		
			Creativity, knowledge management, learning organisation	72	3	0.7%		
		Finance strategy	Financing, equity, financial resources, financial planning	80	6	1.5%	44	10.5%
			Financial planning, budgeting	81	0	0.0%		
			Cost management, cost development	82	20	4.9%		
			Productivity improvement	83	5	1.2%		
			Liquidity management	84	4	1.0%		
	Strategy execution & controlling	Strategy execution, operative and strategic controlling, early warning	Profitability management	85	9	2.2%	3	0.7%
			Activity database, realise; follow up, take action	90	0	0.0%		
			Key performance indicators, balanced scorecard	91	0	0.0%		
			Operative controlling	92	0	0.0%		
			Strategic controlling; reiteration of SP, governance, auditing	93	0	0.0%		
			Risk management	94	3	0.7%		
			Early warning system	95	0	0.0%		
			No answer; no challenge seen; no measures required	100	66	16.1%		
			Do not know	101				
			Strategic management / planning not necessary	102				

Table 7.16: Challenges reported by executives of responding companies

Source: Developed by researcher

Table 7.17 depicts the statements of the respondents regarding measures they plan to take for coping with the challenges ahead. In total 178, (66.2%) statements of executives were

received and 401 response elements were coded and added to the list. A number of 91 (33.2%) respondents do not see the necessity for measures to cope with challenges.

Most of the measures taken are in the areas of personnel recruitment (37) and employee qualification (18). In light of the worldwide economic crisis, some companies will probably not hire additional personal and even may lay off employees, thus changing their focus. As above, this again is evidence of neglected environmental observation and an early warning system. Other important areas are product development (19), improvement of business processes (25), promotion and sales (29), R&D programmes and innovation (23) and the management of the cost development (25). Two companies plan to install an early warning system.

Some statements regarding measures executives will take to meet the challenges ahead, are listed as follows:

- Case 36, Dipl.-Ing.: *“Hire qualified personnel; improve strategic planning and strategic alignment”*.
- Case 90, Dipl.-Ing., MBA: *“Change of vertical integration; introduction of a systematic procedure for technological developments; improve project management and project controlling; multi project management; introduction of an international business model (local added value; partner companies)”*.
- Case 112, Physician with doctoral degree: *“Intensive market observation; mechanisms for fast reaction (early warning); alignment of company to recession”*.
- Case 199, Dipl.-Kfm.: *“Start action to increase productivity, cost reduction; plan strategic sales activities as soon as possible to at least maintain the market shares”*.
- Case 256, Dipl.-Ing., MBA: *“Special public relation activities; new and further developed products; customer loyalty programme”*.

Area of strategic management			Tool	Code	Measure Count	Measure %	Perception count cluster	Measure % cluster	
Strategic management	Strategic thinking & behaviour	Strategic thinking	Strategic mind set, holistic thinking, entrepreneurial thinking, anticipated thinking, common sense, courage	1	7	1.7%	7	1.9%	
		Strategic behaviour	Strategic alignment, strategic planning, secure company, secure success, future orientation, realise potentials, develop company	2	10	2.5%	10	2.4%	
	Area of strategic planning process	Strategic analysis and assessment	Challenges in external environment	External environment	10	7	1.7%	7	1.7%
				Globalisation	10.1				
				Real estate / bank / financial crisis	10.2				
				Business cycles, recession, depression	10.3				
				Currency exchange rates	10.4				
				Competition from Asia, low wage countries	10.5				
				Competitive pressure, price pressure	10.6				
			Market development, trends	10.7					
			Internal environment	11	2	0.5%	3	0.7%	
			SWOT	12	0	0.0%			
		Scenario technique	13	1	0.2%				
		Strategic premises and settings	Vision	Mission	21	0	0.0%	3	0.7%
				Objectives	22	0	0.0%		
				Corporate identity programme	23	1	0.2%		
				Values, social responsibility, policies, philosophy, culture	24	2	0.5%		
				Strategic direction, key success factors, key competences	30	1	0.2%		
		Strategy formulation	Product/ market strategies	Portfolio techniques	31	2	0.5%	70	18.1%
				Market penetration	32	6	1.5%		
				Market development	33	5	1.2%		
				Product development	34	19	4.7%		
				Diversification	35	4	1.0%		
				Growth strategies; internal, external	36	7	1.7%		
			Internationalisation marketing, production sites, procurement	37	11	2.7%			
			Integration strategies	38	2	0.5%			
			Strategic alliances, partnerships	39	13	3.2%			
			Organisational structure, management of change, turn around	40	14	3.5%	74	19.0%	
			Business processes, EDP, project management	41	25	6.2%			
			Quality management	42	4	1.0%			
			Ecology	43	2	0.5%			
			Supply chain management	44	1	0.2%			
			Outsourcing	45	7	1.7%			
		Production transfer	46	2	0.5%				
		Equipment, production capacity, investments, infrastructure	47	17	4.2%				
		Operative planning and management	48	2	0.5%				
		Procurement, availability of goods, suppliers	49	0	0.0%				
		Leadership, delegation, motivation, information	50	9	2.2%	72	17.3%		
		HR strategy	HR marketing	51	4			1.0%	
			HR planning, recruiting	52	37			9.2%	
			HR development, employee qualification	53	18			4.5%	
			HR target agreement, assessment, remuneration	54	2			0.5%	
			Suggestions, continuous improvement	55	2	0.5%			
		Marketing strategy	Segmentation, market niches	Positioning, branding	61	1	0.2%	67	15.9%
				Differentiation	62	2	0.5%		
				Market research	63	5	1.2%		
				Product mix	64	10	2.5%		
				Price mix	65	2	0.5%		
				Promotion, sales	66	29	7.2%		
				Distribution	67	0	0.0%		
				Marketing	68	9	2.2%		
				Customer satisfaction, loyalty, value, support	69	4	1.0%		
			R&D strategy	R&D progr., technological leadership, new technology, innovation	70	23	5.7%	30	7.8%
		Innovation management		71	2	0.5%			
		Creativity, knowledge management, learning organisation		72	5	1.2%			
		Finance strategy	Financing, equity, financial resources, financial planning	80	5	1.2%	47	11.9%	
			Financial planning, budgeting	81	1	0.2%			
			Cost management, cost development	82	25	6.2%			
			Productivity improvement	83	13	3.2%			
			Liquidity management	84	2	0.5%			
			Profitability management	85	1	0.2%			
		Strategy execution & controlling	Strategy execution, operative and strategic controlling, early warning	Activity database, realise, follow up, take action	90	0	0.0%	11	2.6%
				Key performance indicators, balanced scorecard	91	1	0.2%		
	Operative controlling			92	8	2.0%			
	Strategic controlling; reiteration of SP, governance, auditing			93	0	0.0%			
	Risk management			94	0	0.0%			
	Early warning system			95	2	0.5%			
				No answer; no challenge seen; no measures required	100	91	22.7%	91	
				Do not know	101			0	
				Strategic management / planning not necessary	102			0	

Table 7.17: Measures planned by executives to meet challenges

Source: Developed by researcher

Summary of findings from this sub-section:

- Most companies see the challenges in the external environment.
- Many companies were surprised by the economic crisis.
- Most measures taken are in the areas of personnel recruitment (37) despite signs of the forthcoming economic crisis.
- There is evidence of a lack of consequent environmental observation and an early warning system.

This section has provided answers to research question 2 regarding the state of the strategic management practice in the research sector. Responding executives apply, on average, only about two-thirds of the listed strategic management tools. This relates to the lack of strategic management knowledge. Engineers are significantly under-represented in the application of strategic management tools. Their lack of application of marketing instruments is to be noted. The strategic planning process is widely used by responding companies. However, questions arose over the quality of the planning process. There is evidence that some executives mix up strategic planning with operative planning. SME executives consider strategic planning as too theoretical and too complex. Academics, providing tools and systems for strategic management should consider this. Most of the companies plan to improve strategic management by offering seminars and literature, or engage external consultants. Key elements in the perception of strategic management are strategic behaviour, objectives and strategy execution, but some elements such as scenario technique, internationalisation, or ecology are not mentioned. Most companies see the challenges ahead in the external environment. But, it is evident that signs of forthcoming economic crisis were not recognised. Many companies are still preoccupied with the recruitment of personnel although the worldwide crisis is evident.

The next section goes on to analyse and evaluate research data regarding the impact of strategic management on performance outcome.

7.7 Relation of education and strategic management practice with performance outcome

The following sections analyse and evaluate data from the SPSS data set regarding the relation of the education type and strategic management with various dependent variables. The aim is to answer research question 3: What is the relation of education and strategic management practice with the performance outcome? as well as corresponding sub-questions.

Note: The year 2007 was a normal business year in the machinery and equipment sector. Signs of economic crisis emerged in early 2008 (Wirtschaftswoche, 2008) and the crisis itself began to hit German companies in the second half of 2008.

7.7.1 Relation of education type with performance outcome

This sub-section answers research sub-question 3a: What is the relation of education with

performance outcome?

For the following evaluations, only executives in charge of strategic management and companies applying strategic planning are considered.

Figure 7.29 depicts the average turnover per employee of the different educational types. Business engineers achieve on average the highest turnover per employee (€ 200.6 thousand) followed by engineers (€ 182.9 thousand) and business economists (€ 179.1 thousand). MBAs and those with other technical education achieve the lowest rates. The chart suggests that business engineers tend to focus on efficiency in comparison with those of other educational background.

With the aid of the SPSS “compare means” modelling and the ANOVA table the relation of the type of education with the average turnover per employee was evaluated. Although the bar chart shows different average numbers and suggests that business engineers generate on average a higher turnover per employee there is no significant statistical difference between the means of the groups (Sig. 0.286).

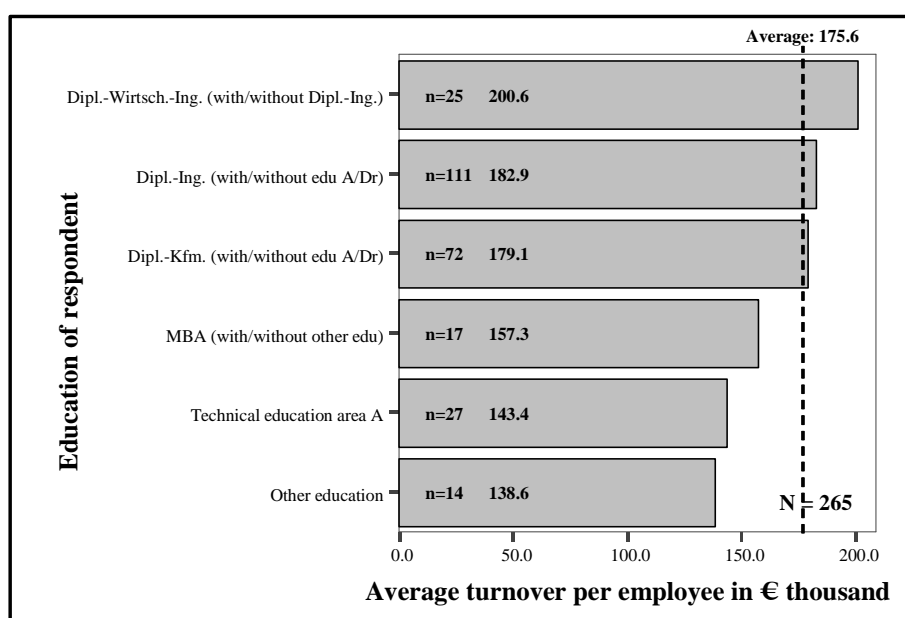


Figure 7.29: Average turnover per employee of education types (clustered)

Source: Developed by researcher

Figure 7.30 depicts the average return on sales of the different educational types. According to the bar chart, MBAs generate on average the highest (8.1%) and engineers the lowest return on sales (6.7%). The chart suggests that MBAs tend to focus on bottom line profit while engineers may not.

With the aid of the SPSS “compare means” modelling and the ANOVA table, the relation of the type of education with the average return on sales was evaluated. The bar chart shows different average numbers and suggests that engineers generate on average lower profit. However, there is no significant statistical difference between the means of the groups (Sig. 0.861).

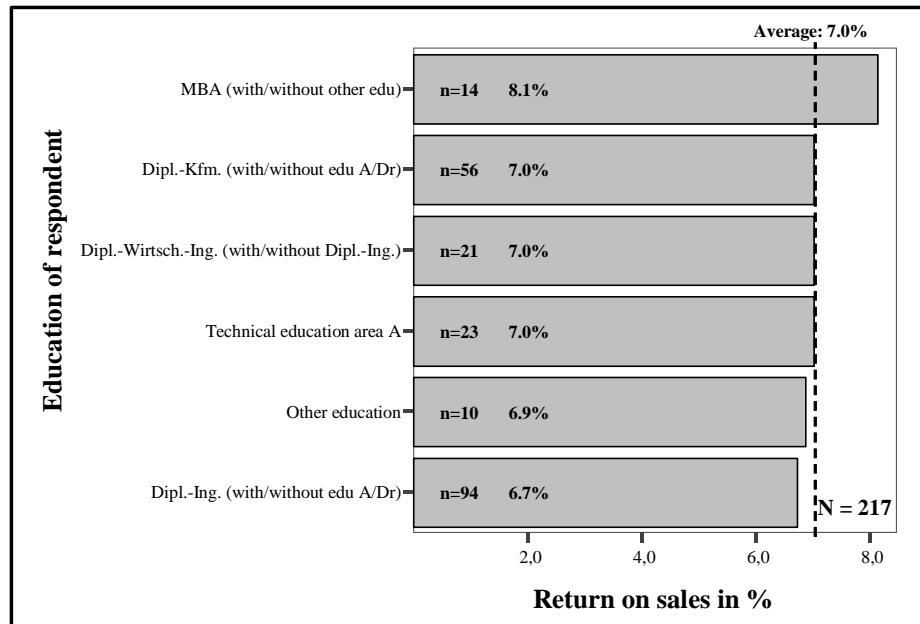


Figure 7.30: Average return on sales of education types

Source: Developed by researcher

Figure 7.31 depicts the average equity ratio of the different types of education. The business economists show on average the highest equity ratio (35.8%) followed by business engineers (35.5%) and engineers (32.1%). According to the bar chart, MBAs achieve the lowest equity ratio (27.5%). The chart suggests that business economists tend to focus on the balance sheet while MBAs may not.

With the aid of the SPSS “compare means” modelling and the ANOVA table, the relation of the type of education with the average equity was evaluated. There is no significant statistical difference between the means of the groups (Sig. 0.416).

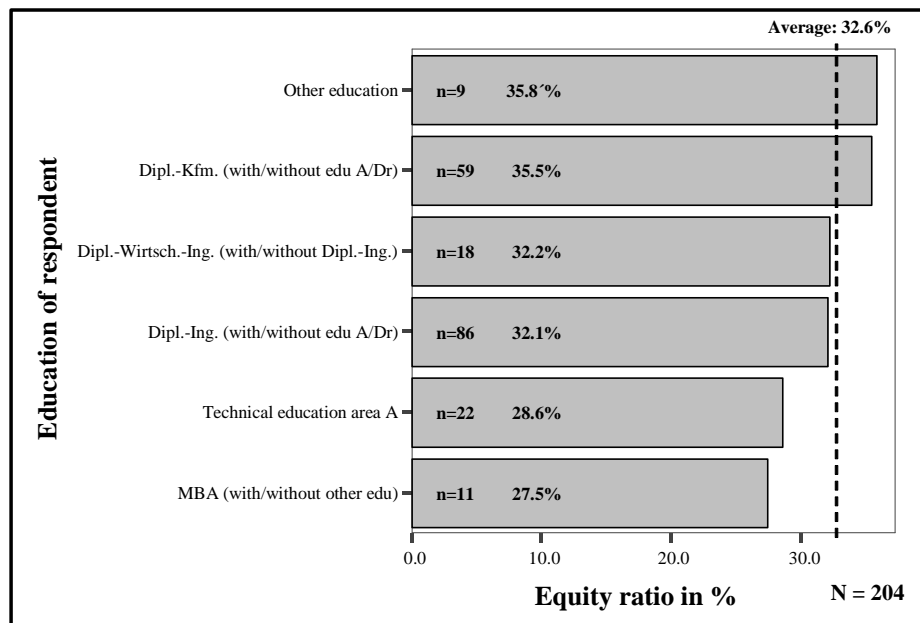


Figure 7.31: Average equity ratio of education types

Source: Developed by researcher

Figure 7.32 depicts the average R&D ratio of the different educational types. MBAs show

on average the highest R&D rate (4.3%) followed by engineers (3.2%). Companies led by business economists show a rate of 2.7%. The chart suggests that MBAs and engineers tend to focus on innovation.

With the aid of the SPSS “compare means” modelling and the ANOVA table the relation of the type of education with the R&D ratio was evaluated. There is no significant statistical difference between the means of the groups (Sig. 0.226).

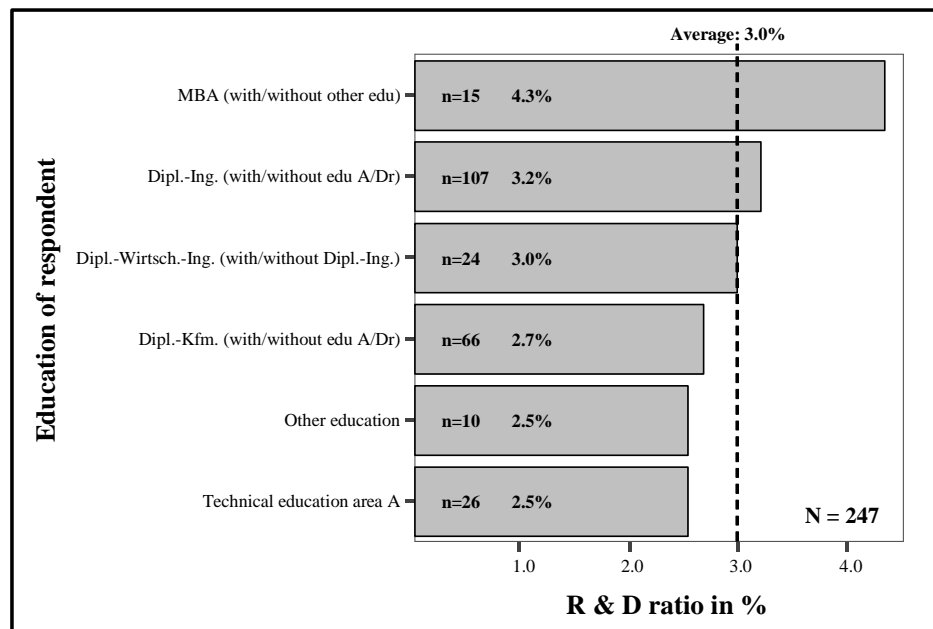


Figure 7.32: Average R&D ratio of education types

Source: Developed by researcher

Figure 7.33 depicts the average continuous improvement rate (number of suggestions per employee) of the different educational types.

Only companies who have a suggestion system in place are considered in the evaluation (163 cases). About 39% of the responding companies have no suggestion system in place. MBAs generate on average the highest continuous improvement rate (0.41) followed by the other educational types that are on average (0.31% respectively 0.28%). The bar chart suggests that MBAs tend to promote employee suggestions.

With the aid of the SPSS “compare means” modelling and the ANOVA table the relation of the type of education with the continuous improvement rate was evaluated. However, there is no significant statistical difference between the means of the groups (Sig. 0.786).

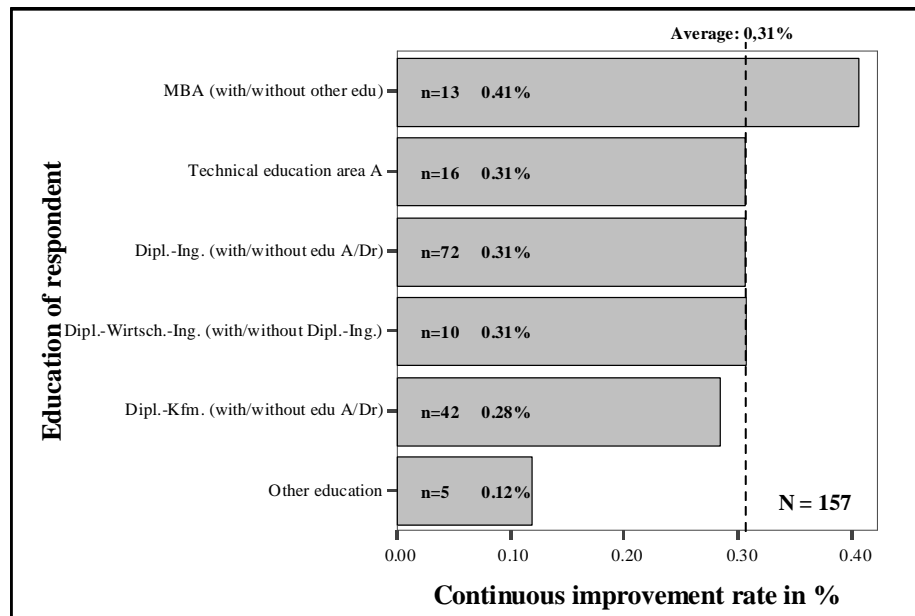


Figure 7.33: Average continuous improvement rate of education types

Source: Developed by researcher

Summary of findings from this sub-section:

- Business engineers generate on average the highest turnover per employee, followed by engineers.
- MBAs generate on average the highest return on sales while engineers generate the lowest rate.
- Companies led by business economists have the highest average equity ratio, companies led by MBAs have the lowest rate.
- Companies led by MBAs have the highest average R&D ratio, followed by companies managed by engineers.
- Companies managed by MBAs have the highest average continuous improvement rate, followed by companies led by engineers and business engineers.
- However, there is no significant statistical difference between the means of the groups for all evaluations above.

7.7.2 Relation of continuing strategic management education with performance outcome

This sub-section answers research sub-question 3b: What is the relation of continuing strategic management education with performance outcome?

In this sub-section, the relation of continuing education in strategic management with variables related to the performance of the company is evaluated with the aid of linear regression and ANOVA test.

Table 7.18 lists the results of the analyses. For all models, the null hypothesis is proven. There is no significant relation between continuing training in strategic management and

the dependent variables.

ANOVA(b)						
Model; dependent variable (b)		Sum of squares	df	Mean square	F	Sig.(a)
1. Turnover per employee	Regression	939.985	1	939.985	0.078	0.780
	Residual	3089915.575	258	11976.417		
	Total	3090855.560	259			
2. Return on sales	Regression	0.004	1	0.004	0.000	0.985
	Residual	2745.477	212	12.950		
	Total	2745.481	213			
3. Equity ratio	Regression	132.286	1	132.286	0.532	0.467
	Residual	49486.620	199	248.676		
	Total	49618.905	200			
4. R&D ratio	Regression	10.478	1	10.478	1.642	0.201
	Residual	1537.819	241	6.381		
	Total	1548.296	242			
5. Continuous improvement rate	Regression	0.062	1	0.062	0.467	0.495
	Residual	20.260	152	0.133		
	Total	20.323	153			
a. Predictor: (Constant), Number of seminar days in last five years						

Table 7.18: ANOVA, relation continuing training and various variables

Source: Developed by researcher

Summary of findings from this sub-section:

- No significant relation between continuing management training and performance parameters.

7.7.3 Relation of strategic management practice with performance outcome

This sub-sections answers research sub-question 3c: What is the relation of strategic management practice with performance outcome?

In the following, the relation of the respondent's strategic management tool application rate with variables related to the performance of the company is evaluated with the aid of linear regression and ANOVA test. Evaluated variables with a significance level of Sig. \leq 0.050, respectively borderline cases, are further analysed with a scatter plot.

For the following statistical models, only executives in charge of strategic management and companies applying strategic planning are considered.

Table 7.19 lists the results of the analyses with the aid of linear regression. For models return on sales, equity ratio and continuous improvement rate, the null hypothesis is proven. There is no significant relation between the application of strategic management tools and these dependent variables.

For model 4, R&D ratio, the null hypothesis is to be rejected in favour of the alternative hypothesis H_1 . The relation of strategic management tool application rate with the R&D ratio variables is significant.

Model 1, turnover per employee is a borderline case. The significance level Sig 0.053 suggests a relation of strategic management tool application rate with this dependent variable.

ANOVA(b)						
Model; dependent variable (b)		Sum of squares	df	Mean square	F	Sig.(a)
1. Turnover per employee	Regression	48625.657	1	48625.657	3.785	0.053
	Residual	2659140.326	207	12846.089		
	Total	2707765.983	208			
2. Return on sales	Regression	1.745	1	1.745	0.131	0.718
	Residual	2285.566	172	13.288		
	Total	2287.310	173			
3. Equity ratio	Regression	0.784	1	0.784	0.003	0.956
	Residual	41472.844	162	256.005		
	Total	41473.628	163			
4. R&D ratio	Regression	38.134	1	38.134	6.166	0.014
	Residual	1230.762	199	6.185		
	Total	1268.896	200			
5. Continuous improvement rate	Regression	0.032	1	0.032	0.260	0.611
	Residual	15.601	126	0.124		
	Total	15.633	127			
a. Predictor: (Constant), SM tool application rate (persons in charge SM, companies applying SP)						

Table 7.19: ANOVA, relation of SM tool application with various variables

Source: Developed by researcher

Figure 7.34 shows the scatter plot for the strategic management application rate of the respondent and the R&D ratio at a 95% confidence interval. The fit lines and equation point to the fact that the R&D ratio in the company increases with the strategic management tool application rate of the leading executive. This suggests that executives with a higher application rate of strategic management tools put more emphasis on innovation.

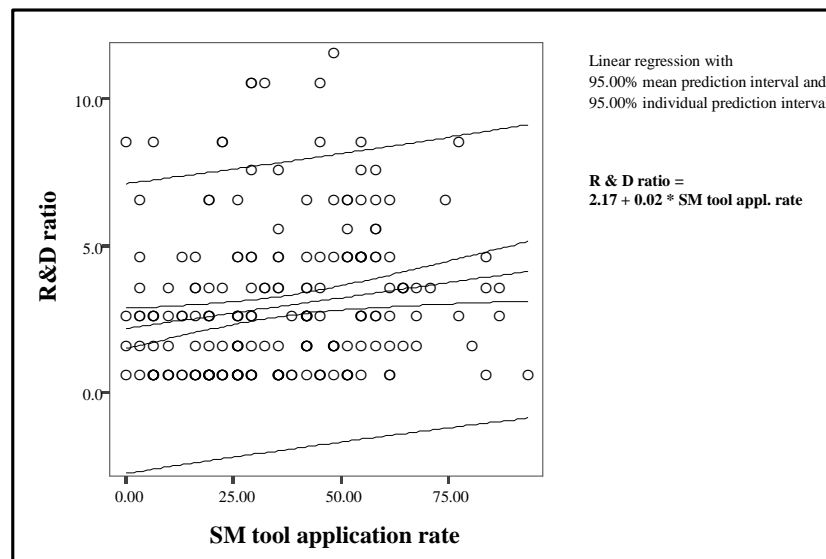


Figure 7.34: Relation of SM tool application rate with R&D ratio

Source: Developed by researcher

Figure 7.35 shows the scatter plot for the strategic management application rate of the leading executive and the turnover per employee at a 95% confidence interval. Fit lines and equation suggest that executives applying more strategic management tools are more efficient and generate a higher turnover per employee.

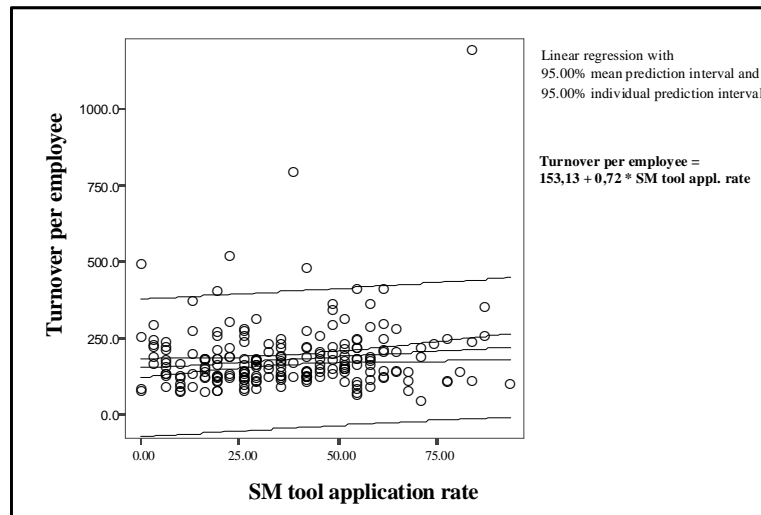


Figure 7.35: Relation of SM tool application rate with turnover per employee

Source: Developed by researcher

In the following, the relation of the year of introduction of strategic management with variables related to the performance of the company is evaluated with the aid of linear regression and ANOVA test. Evaluated variables with a significance level of $\text{Sig.} \leq 0.050$ respectively borderline cases are further analysed with a scatter plot.

Only executives in charge of strategic management and companies applying strategic planning are considered.

Table 7.20 lists the results of the analyses with the aid of linear regression. For the models turnover per employee, R&D ratio and continuous improvement rate the null hypothesis is proven. There is no relation between the year strategic planning was introduced and these dependent variables.

For model 2, return on sales, the null hypothesis is to be rejected in favour of the alternative hypothesis H_1 . The relation of the year strategic planning with the dependent variable return on sales is significant.

Model 3, equity ratio, is also a borderline case. The significance level $\text{Sig.} 0.072$ suggests a relation of strategic management tool application rate with this dependent variable.

ANOVA(b)						
Model; dependent variable (b)		Sum of squares	df	Mean square	F	Sig.(a)
1. Turnover per employee	Regression	2760.152	1	2760.152	0.210	0.648
	Residual	2909889.947	221	13166.923		
	Total	2912650.099	222			
2. Return on sales	Regression	95.372	1	95.372	8.467	0.004
	Residual	2094.984	186	11.263		
	Total	2190.356	187			
3. Equity ratio	Regression	767.386	1	767.386	3.284	0.072
	Residual	40654.063	174	233.644		
	Total	41421.449	175			
4. R&D ratio	Regression	2.611	1	2.611	0.378	0.539
	Residual	1457.652	211	6.908		
	Total	1460.263	212			
5. Continuous improvement rate	Regression	0.340	1	0.340	2.760	0.099
	Residual	16.990	138	0.123		
	Total	17.330	139			
a. Predictor: (Constant), Year strategic planning was introduced						

Table 7.20: ANOVA, relation year strategic planning was introduced with variables

Source: Developed by researcher

Figure 7.36 shows the scatter plot for the year companies introduced strategic planning and the return on sales at a 95% confidence interval. The fit lines indicate that the company's return on sales declines the later strategic planning was introduced. Companies seem to benefit from the early introduction of strategic planning.

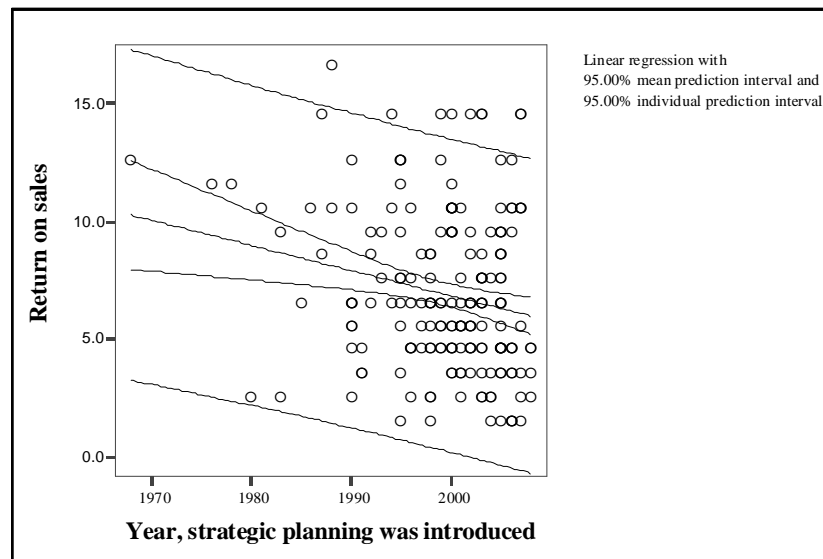


Figure 7.36: Relation of year strategic planning was introduced with return on sales

Source: Developed by researcher

Figure 7.37 shows the scatter plot for the year companies introduced strategic planning and the equity ratio at a 95% confidence interval. The fit lines suggest a relation between the year strategic planning was introduced with the equity ratio. Companies might have generated or maintained a high equity ratio, if they had introduced strategic planning earlier.

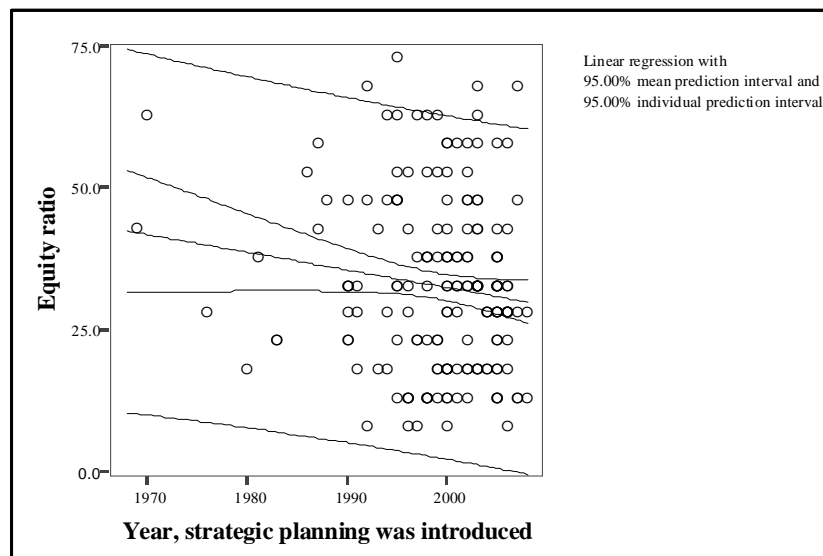


Figure 7.37: Relation of year strategic planning was introduced with equity ratio

Source: Developed by researcher

In addition to the analyses above, the following evaluations of relation were carried out with the aid of the SPSS “compare means” modelling and the ANOVA table.

One analysis is the relation of the application of individual strategic management tools

with performance. Table Apx.2 in the appendix B lists the levels of significance of the relation of individual strategic management tools with performance indicators. Some relations with high significance level were further analysed. Responding companies using benchmarking, SWOT, a mission statement, overhead value analysis, balanced scorecard and risk management have a significantly higher turnover per employee (27.0% to 28.4% higher). Companies having TQM in place seem to be more innovative and spend 34.6% more on R&D. Companies carrying out overhead analysis show an average return on sales of 7.1% compared to other companies (6.7%).

The relation of the strategic planning process with performance measures was evaluated. No significant relation was discovered. The significance levels are Sig. 0.404 to 0.823.

The analysis of relation of whether the strategic planning process is carried out or not with performance indicators also did not reveal any significance (Sig. 0.111 to 0.926)

Testing the relation of the barriers to strategic planning with performance indicators did also not reveal any significance (Sig. 0.123 to 0.994)

The relation of motivation to carry out strategic planning with performance measures was evaluated. The significance levels are Sig. 0.015 to 0.983. Two subjects with significant relation were further evaluated. Companies having a strategic planning process in place because the parent company requires it, have an average turnover per employee of € 226.9 thousand compared to other companies (€ 170.2 thousand). This suggests that mother companies provide a positive influence on their subsidiaries regarding efficiency (Sig. 0.015). Companies who consider the strategic planning process important for the future, seem to be more innovative and have on average a R&D ratio of 3.1% compared to other companies who spend 1.6% (Sig. 0.047).

The relation of the communication of strategic planning elements with performance indicators was evaluated. The significance levels are Sig. 0.006 to 0.919. Three subjects with significant relation were further evaluated. Companies who communicate the strategic plan or elements thereof to all employees, achieve an average turnover per employee of € 199.4 thousand compared to other companies (€ 157.9 thousand). This suggests that involving all employees in strategic planning leads to more efficiency (Sig. 0.007). Companies who communicate their strategic plan to equity owners show an average equity ratio of 36.3% compared to other companies who have ratio of 30.7%. This suggests that equity owners positively influence their subsidiaries through governance (Sig. 0.006). Companies who communicate their strategic plan to the top managers only show an average equity ratio of 27.3% compared to other companies (31.1%). This suggests that companies who keep their strategic plan more or less secret, are less successful in the long run (Sig. 0.016).

The relation of the execution of the strategic plan with performance measures was evaluated. The significance levels are Sig. 0.003 to 0.995. Three subjects with significant relation were further evaluated. Companies who use key figure tables achieve an average turnover per employee of € 205.8 thousand compared to other companies (€ 164.9

thousand). This suggests that working with key figures and controlling the company leads to more efficiency (Sig. 0.012). Companies who follow up activities from the strategic plan in special strategy meetings generate an average turnover per employee of € 193.5 thousand compared to other companies (€ 163.7 thousand). This also suggests that a consequence of following the strategic plan leads to more efficiency (Sig. 0.048). Companies who use the balanced scorecard have an average continuous improvement rate that is twice as high as that of other companies (0.548% versus 0.271%). This strongly suggests that companies who employ the balanced scorecard look at several key performance indicators in different areas of the company and may even have the continuous improvement rate on it (Sig. 0.003).

The relation of the improvements of strategic management with performance measures was evaluated. No significant relation was discovered (Sig. 0.078 to 0.893).

Summary of findings from this sub-section:

- There is a significant relation between the strategic management tool application rate and the R&D ratio.
- There is a relation between the strategic management tool application rate and turnover per employee.
- There is a significant relation between the year strategic planning was introduced and return on sales.
- There is a relation of the year strategic planning was introduced with the equity ratio.
- There is a significant relation between some individual strategic management tools and performance measures.
- There is no significant relation between the type of strategic planning process and performance measures.
- There is no significant relation between realisation of strategic planning and performance measures.
- There is no significant relation between barriers to strategic planning and performance measures.
- There is a significant relation of some elements between motivation for strategic planning and performance measures.
- There is a significant relation between some elements of the communication of strategic plans and performance measures.
- There is a significant relation between some elements of the execution of strategic plans and performance measures.

This section has provided answers to research question 3 regarding the relation of the education and strategic management practice with the performance outcome in the research sector. The evaluation of the relation of the type of education with performance

outcome did not reveal any statistical significance although the bar chart depicts differences. It appears, for instance, that engineers generate a lower return on sales compared to other education types. On the other hand, engineers seem to be more innovation orientated. The impact of continuing management education on the company performance was analysed. No significant relation could be detected. The relation of the strategic management practice with company performance measures was tested with a variety of variables. There is evidence that executives with a higher strategic management tool application rate put more emphasis on innovation. There is also evidence that companies generate more profit if they introduced strategic planning at an early stage. The impact of the application of individual management tools was tested. Some tools have significant relation with performance measures. The same applies to other elements of strategic management such as motivation for strategic planning, as well as communication and execution of strategic plans.

The next section goes on to analyse and evaluate research data regarding the relation of the respondents age with strategic management knowledge, practice and performance outcome.

7.8 Relation of age with strategic management knowledge, practice and performance outcome

The following sections analyse and evaluate data from the SPSS data set regarding the relation of the executives' age with various dependent variables. The aim is to answer research question 4: What is the relation of the managers' age with strategic management knowledge, practice and performance outcome? as well as corresponding sub-questions.

7.8.1 Relation of age with strategic management knowledge and practice

This sub-section answers research sub-question 4a: What is the relation of the managers' age with strategic management knowledge and practice?

In this sub-section, the relation of the respondent's age with other variables related to his knowledge and praxis of strategic management is evaluated with the aid of linear regression and ANOVA test. Evaluated variables with a significance level of $\text{Sig.} \leq 0.050$ are further analysed with a scatter plot.

Table 7.21 lists the results of the analyses with the aid of linear regression. For models strategic management tools applied and number of seminar days within the last five years the null hypothesis is proven. There is no relation between age of the respondent and these dependent variables.

For models number of strategic management tools acquired and strategic management tool absorption rate, the null hypothesis is to be rejected in favour of the alternative hypothesis H_1 . The relation of age with these dependent variables is significant.

ANOVA(b)						
Model; dependent variable (b)		Sum of squares	df	Mean square	F	Sig.(a)
1. Number of strategic management tools acquired	Regression	809.235	1	809.235	12.217	0.001
	Residual	17155.784	259	66.239		
	Total	17965.019	260			
2. Number of strategic management tools applied	Regression	15.177	1	15.177	0.354	0.552
	Residual	11062.423	258	42.878		
	Total	11077.600	259			
3. Strategic management tool absorption rate	Regression	9318.498	1	9318.498	14.280	0.000
	Residual	165091.539	253	652.536		
	Total	174410.037	254			
4. Number of seminar days in last 5 years	Regression	659.819	1	659.819	1.986	0.160
	Residual	86051.974	259	332.247		
	Total	86711.793	260			
a. Predictor: (Constant), Age of the respondent						

Table 7.21: ANOVA, relation of age with various variables (SM tools)

Source: Developed by researcher

Figure 7.38 shows the scatter plot for the age of the respondent and the number of strategic management tools acquired at a 95% confidence interval. The fit lines and equation show that the knowledge of strategic management tools, acquired during education and afterwards in seminars or by self-study, declines with the age of the respondent. Obviously, older executives have failed in the effort to keep their management knowledge up to date.

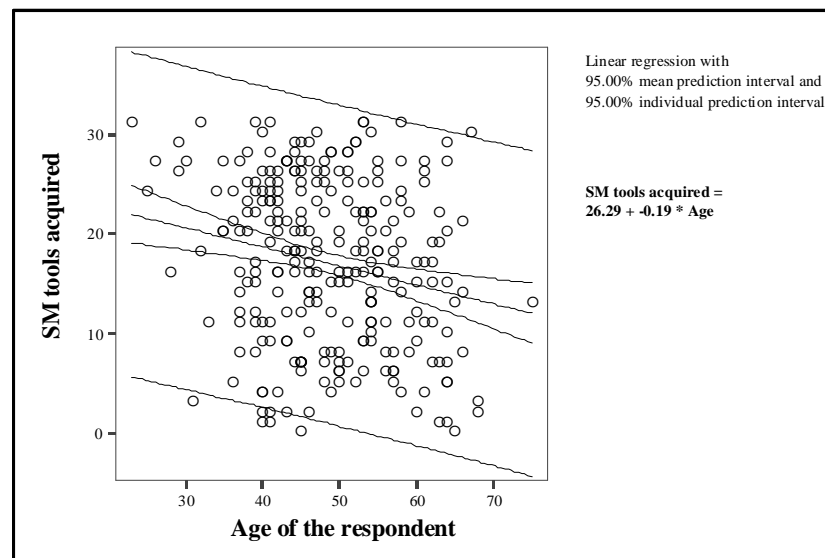


Figure 7.38: Relation of age with number of SM tools acquired

Source: Developed by researcher

Figure 7.39 shows the scatter plot for the age of the respondent and the strategic management absorption rate (Computed variable: Number of SM tool applied / Number of SM tools acquired*100) at a 95% confidence interval. The fit lines and equation indicate that the strategic management tool absorption rate increases with the age of the respondent. This suggests that older executives are more inclined to appreciate the knowledge they have of strategic management and apply it.

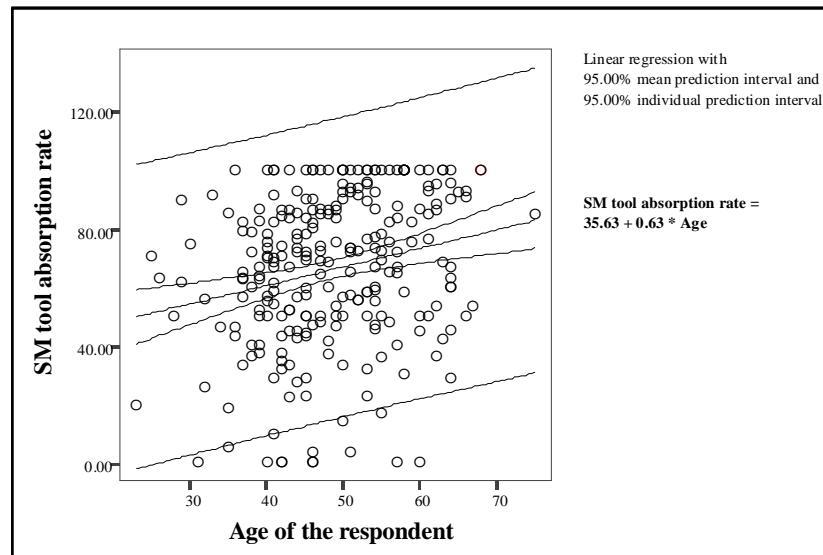


Figure 7.39: Relation of age with SM absorption rate

Source: Developed by researcher

Summary of findings from this sub-section:

- Older executives have less knowledge of strategic management.
- Strategic management tool absorption rate increases with the age of the respondent.

7.8.2 Relation of age with performance outcome

This sub-section answers research sub-question 4b: What is the relation of the managers' age with the performance outcomes of the company they lead?

In this sub-section, the relation of the respondent's age with variables related to the performance of the company is evaluated with the aid of linear regression and ANOVA test. Evaluated variables with a significance level of $\text{Sig.} \leq 0.050$ are further analysed with a scatter plot.

Table 7.22 lists the results of the analyses with the aid of linear regression. For model turnover per employee, return on sales, equity ratio and R&D ratio the null hypothesis is proven. There is no relation between age of the respondent and these dependent variables.

For model five, continuous improvement rate the null hypothesis is to be rejected in favour of the alternative hypothesis H_1 . The relation of age with the mentioned dependent variable is significant.

ANOVA(b)						
Model; dependent variable (b)		Sum of squares	df	Mean square	F	Sig.(a)
1. Turnover per employee	Regression	58.037	1	58.037	0.005	0.946
	Residual	2744289.808	216	12705.045		
	Total	2744347.845	217			
2. Return on sales	Regression	1.348	1	1.348	0.098	0.755
	Residual	2446.452	178	13.744		
	Total	2447.800	179			
3. Equity ratio	Regression	367.514	1	367.514	1.491	0.224
	Residual	41403.809	168	246.451		
	Total	41771.324	169			
4. R&D ratio	Regression	0.976	1	0.976	0.148	0.701
	Residual	1367.129	207	6.604		
	Total	1368.105	208			
5. Continuous improvement rate	Regression	0.921	1	0.921	7.890	0.006
	Residual	14.819	127	0.117		
	Total	15.739	128			
a. Predictor: (Constant), Age of the respondent in charge of SM						

Table 7.22: ANOVA, relation of age with various variables (performance)

Source: Developed by researcher

Figure 7.40 shows the scatter plot for age of the respondent and the continuous improvement rate at a 95% confidence interval. The fit lines and equation suggest that the continuous improvement rate declines with the age of the respondent. Older executives seem to be less inclined to employ management tools such as the continued improvement process.

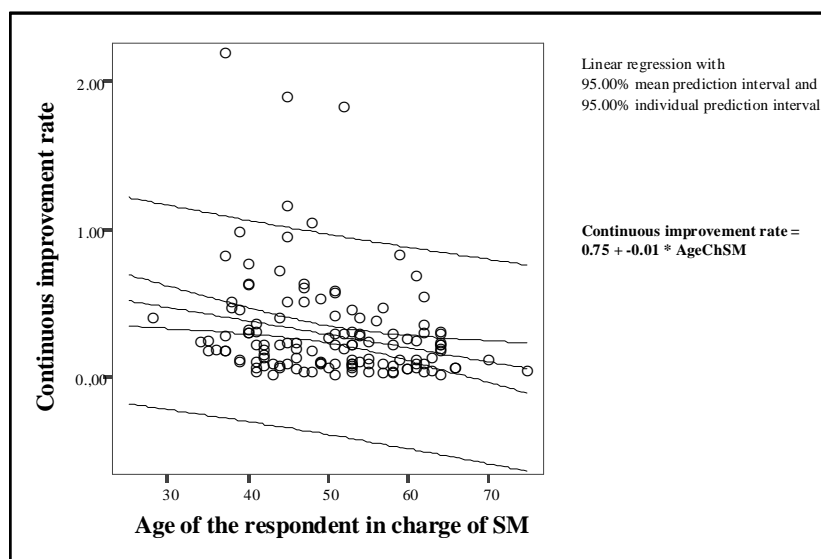


Figure 7.40: Relation of age with continuous improvement rate

Source: Developed by researcher

Summary of findings from this sub-section:

- Companies managed by older executives have a lower rate of continuous improvement.
- Otherwise, no significant relation of age with performance.

This section has provided answers to research question 4 regarding the relation of the respondents age with strategic management knowledge, practice and performance outcome in the research sector. There is evidence that older executives have failed to keep the

management knowledge up to date. On the other hand, older executives seem to be more inclined to apply acquired knowledge. There is evidence that older executives seem to be less inclined to employ management tools such as the continued improvement process.

The next section goes on to analyse and evaluate research data regarding the relation of the respondent's seniority with strategic management knowledge, practice, performance measures and education.

7.9 Relation of seniority with strategic management knowledge, practice, performance outcome and education

The following sections analyse and evaluate data from the SPSS data set regarding the relation of the executives' seniority with various dependent variables. The aim is to answer research question 5: What is the relation of the managers' seniority with strategic management knowledge, practice, performance outcome and education? as well as corresponding sub-questions.

7.9.1 Relation of seniority with strategic management knowledge and practice

This sub-sections answers research sub-question 5a: What is the relation of the managers' seniority with strategic management knowledge and practice?

In this sub-section, the relation of the respondent's seniority with other variables related to his knowledge and praxis of strategic management is evaluated with the aid of linear regression and ANOVA test. Evaluated variables with a significance level of $\text{Sig.} \leq 0.050$ are further analysed with a scatter plot.

Table 7.23 lists the results of the analyses with the aid of linear regression. For model strategic management tools applied and number of seminar days in the last 5 years the null hypothesis is proven. There is no significant statistical relation between seniority of the respondent and these dependent variables.

For model strategic management tools acquired and strategic management tool absorption rate the null hypothesis is to be rejected in favour of the alternative hypothesis H_1 . The relation of seniority with these dependent variables is significant.

ANOVA(b)						
Model; dependent variable (b)		Sum of squares	df	Mean square	F	Sig.(a)
1. Number of strategic management tools acquired	Regression	1019.310	1	1019.310	15.579	0.000
	Residual	16945.709	259	65.427		
	Total	17965.019	260			
2. Number of strategic management tools applied	Regression	116.191	1	116.191	2.735	0.099
	Residual	10961.409	258	42.486		
	Total	11077.600	259			
3. Strategic management tool absorption rate	Regression	3768.878	1	3768.878	5.588	0.019
	Residual	170641.159	253	674.471		
	Total	174410.037	254			
4. Number of seminar days in last 5 years	Regression	726.652	1	726.652	2.189	0.140
	Residual	85985.141	259	331.989		
	Total	86711.793	260			
a. Predictor: (Constant), Number of years in position						

Table 7.23: ANOVA, relation of seniority with various variables (SM tools)

Source: Developed by researcher

Figure 7.41 depicts the scatter plot for seniority of the respondent and the number of strategic management tools acquired at a 95% confidence interval. The fit lines and equation show that the knowledge of strategic management tools acquired declines with the seniority of the respondent. Executives who have remained in their current position for longer, seem to lack continuing management education and do not keep pertinent knowledge up to date.

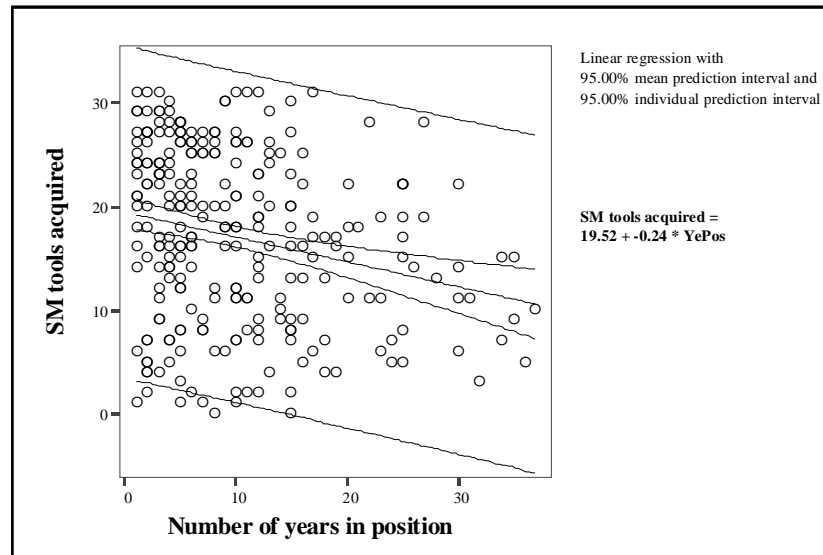


Figure 7.41: Relation of seniority with number of SM tools acquired

Source: Developed by researcher

Figure 7.42 shows the scatter plot for seniority of the respondent and the strategic management tool absorption rate at a 95% confidence interval. The fit lines and equation indicate that the strategic management tool absorption rate increases with the seniority of the respondent. This suggests that executives who keep their position longer are more inclined to appreciate the knowledge they have in strategic management and apply it.

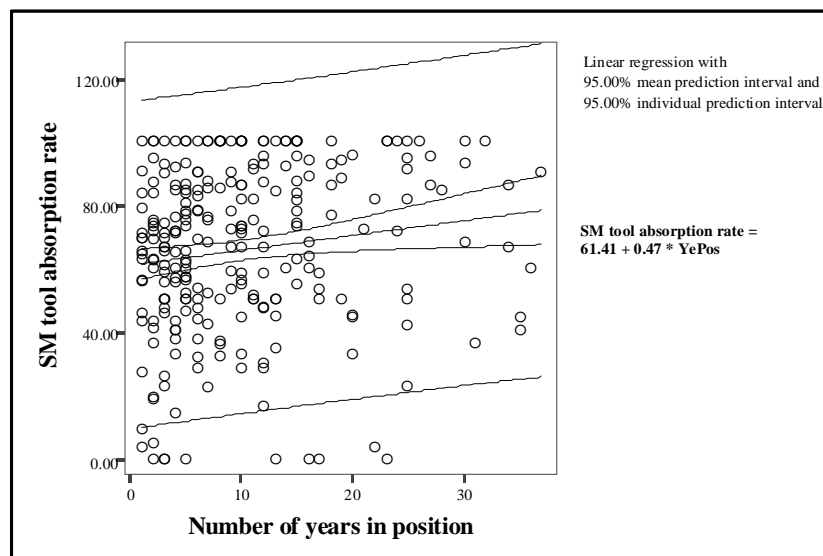


Figure 7.42: Relation of seniority with SM tool absorption rate

Source: Developed by researcher

Summary of findings from this sub-section:

- Executives who have held their current position for only a few years have more knowledge of strategic management.
- Executives who have held their current position for only a few years have a lower strategic management tool absorption rate.
- These findings correlate the relation between age and knowledge of strategic management tools and its absorption rate.

7.9.2 Relation of seniority with performance outcome

This sub-sections answers research sub-question 5b: What is the relation of the managers' seniority with the performance outcomes of the company they lead?

In this sub-section, the relation of the respondent's seniority with variables related to the performance of the company is evaluated with the aid of linear regression and ANOVA test. Evaluated variables with a significance level of $\text{Sig.} \leq 0.050$ are further analysed with a scatter plot.

Table 7.24 lists the results of the analyses with the aid of linear regression. For models turnover per employee and continuous improvement rate, the null hypothesis is proven. There is no relation between age of the respondent and these dependent variables.

For models return on sales, equity ratio and R&D ratio the null hypothesis is to be rejected in favour of the alternative hypothesis H_1 . The relation of seniority with the mentioned dependent variables is significant.

ANOVA(b)						
Model; dependent variable (b)		Sum of squares	df	Mean square	F	Sig.(a)
1. Turnover per employee	Regression	31007.281	1	31007.281	2.480	0.117
	Residual	2713345.747	217	12503.897		
	Total	2744353.027	218			
2. Return on sales	Regression	80.864	1	80.864	6.087	0.015
	Residual	2377.766	179	13.284		
	Total	2458.630	180			
3. Equity ratio	Regression	1425.942	1	1425.942	5.941	0.016
	Residual	40564.702	169	240.028		
	Total	41990.643	170			
4. R&D ratio	Regression	30.374	1	30.374	4.701	0.031
	Residual	1343.822	208	6.461		
	Total	1374.195	209			
5. Continuous improvement rate	Regression	0.242	1	0.242	1.981	0.162
	Residual	15.498	127	0.122		
	Total	15.739	128			
a. Predictor: (Constant), Number of years in position of persons in charge of SM						

Table 7.24: ANOVA, relation of seniority with various variables (performance)

Source: Developed by researcher

Figure 7.43 depicts the scatter plot for the seniority of the respondent and the return on sales at a 95% confidence interval. The fit lines and equation suggest that executives who have been longer in their current position generate a higher return on sales for the company they lead.

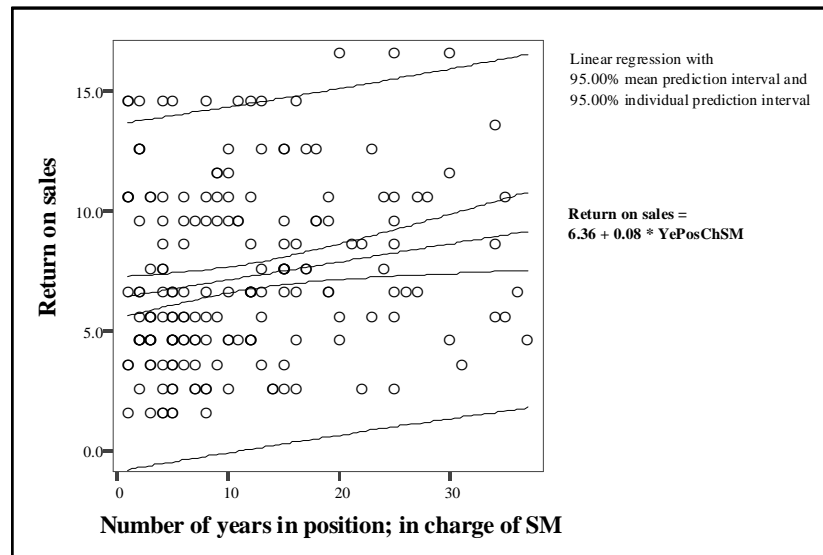


Figure 7.43: Relation of seniority with return on sales

Source: Developed by researcher

Figure 7.44 shows the scatter plot for seniority of the respondent and the equity ratio at a 95% confidence interval. The fit lines and equation suggest that executives longer in their current position generate a higher equity ratio in the company they manage. Seniority seems to foster the company's long term sustained success.

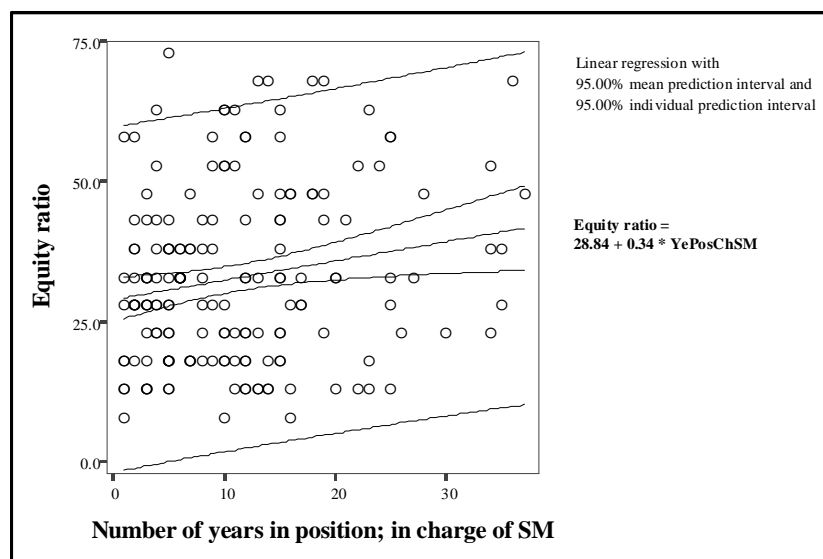


Figure 7.44: Relation of seniority with equity ratio

Source: Developed by researcher

Figure 7.45 shows the scatter plot for seniority of the respondent and the continuous improvement rate at a 95% confidence interval. The fit lines and equation indicate that executives longer in their current position pay more attention to innovation and invest on average more in R&D.

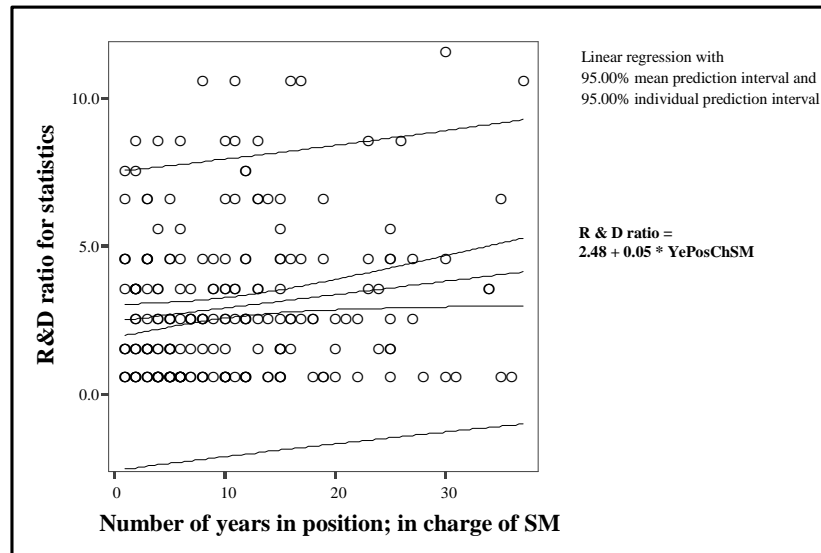


Figure 7.45: Relation of seniority with R&D ratio

Source: Developed by researcher

Summary of findings from this sub-section:

- There is a significant relation between the executive's seniority and return on sales.
- There is a significant relation between the executive's seniority and the equity ratio.
- There is a significant relation between the executive's seniority and the R&D ratio.

Question arising from this sub-section:

- Would one recommend that the the relation of seniority with company performance should be further explored?

7.9.3 Relation of seniority with education

This sub-sections answers research sub-question 5c: What is the relation of the managers' seniority with their education?

Figure 7.46 depicts the mean values of the number of years in the current position of the different educational types sorted by number of years. The average length of service is 10.4 years. Executives with technical education in area A (professional, master, technician) stay longest in their position (15.4 years) followed by engineers (11.6 years). The average seniority of business economists and business engineers is about 8.5 years. Compared to the other educational types, MBAs seem to be the “job hoppers” with an average seniority of only 5.9 years.

With the aid of the SPSS “compare means” modelling and the ANOVA table the relation of the seniority with the type of education was evaluated. The differences between the groups are statistically significant (Sig. 0.000). Thus the seniority is related to and dependent on the type of education.

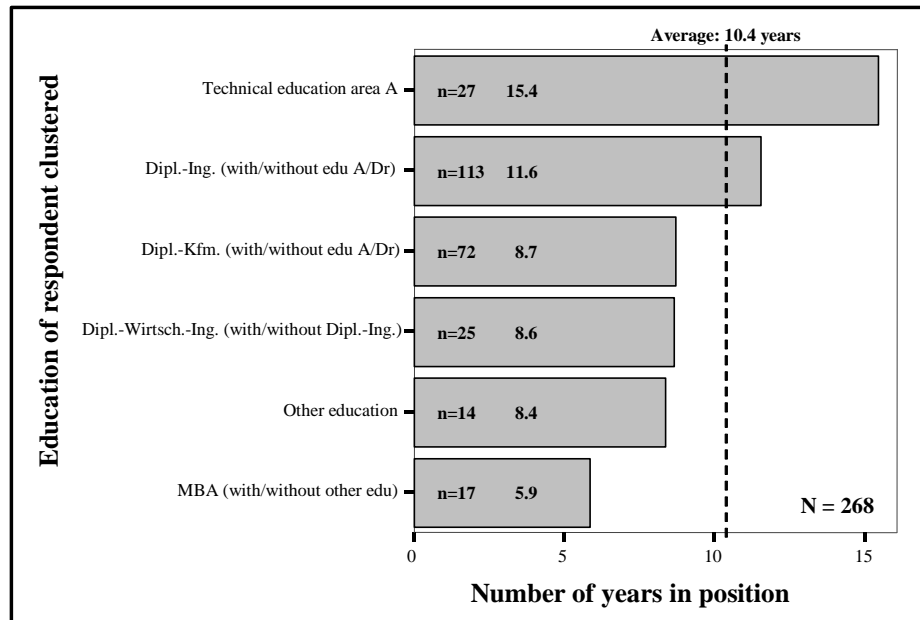


Figure 7.46: Relation of seniority with education

Source: Developed by researcher

Summary of findings from this sub-section:

- Seniority is related to and dependent upon the type of education.

This section has provided answers to research question 5 regarding the relation of the respondent's seniority with strategic management knowledge, practice, performance outcome and education in the research sector. There is evidence that executives, longer in the current position, fail to keep their management knowledge up to date. The evidence that the seniority of executives is related to the performance outcome of the company they manage is interesting. Seniority seems to foster the company's sustained success. Seniority is also related to the type of education. Executives with technical background and engineering degrees stay longer in their position.

The next section goes on to analyse and evaluate research data regarding the relation of company size with strategic management knowledge and practice.

7.10 Relation of the company size with strategic management knowledge and practice

The following sections analyse and evaluate data from the SPSS data set regarding the relation of the company size with strategic management knowledge and practice. The aim is to answer research question 6: What is the relation of the company size with strategic management education and practice? as well as corresponding sub-questions.

7.10.1 Relation of the company size with strategic management knowledge

This sub-section answers research sub-question 6a: What is the relation of the company size with strategic management knowledge?

In this sub-section, the relation of the company's size with variables related to the

acquisition of knowledge is evaluated with the aid of linear regression and ANOVA test. Evaluated variables with a significance level of $\text{Sig.} \leq 0.050$ are further analysed with a scatter plot.

Table 7.25 lists the results of the analyses with the aid of linear regression. For model 2, number of seminar day in the last 5 years, the null hypothesis is proven. There is no relation between the company size and continuing management education.

For model 1, knowledge rate of strategic management tools, the null hypothesis is to be rejected in favour of the alternative hypothesis H_1 . The relation of company size with the mentioned dependent variable is significant.

ANOVA(b)						
Model; dependent variable (b)		Sum of squares	df	Mean square	F	Sig.(a)
1. SM tool knowledge rate	Regression	11463.552	1	11463.552	17.095	0.006
	Residual	173006.912	258	670.569		
	Total	184470.463	259			
2. Number of seminar days in last 5 years	Regression	42.780	1	42.780	0.128	0.721
	Residual	86303.970	258	334.512		
	Total	86346.750	259			
a. Predictor: (Constant), Turnover of the company in € million						

Table 7.25: ANOVA, relation of the company size with various variables (SM knowledge)

Source: Developed by researcher

Figure 7.47 shows the scatter plot for the company size and the strategic management knowledge rate at a 95% confidence interval. The fit lines and equation suggest an increase of strategic management knowledge with the size of the company. Larger SMEs seem to care more about strategic management knowledge.

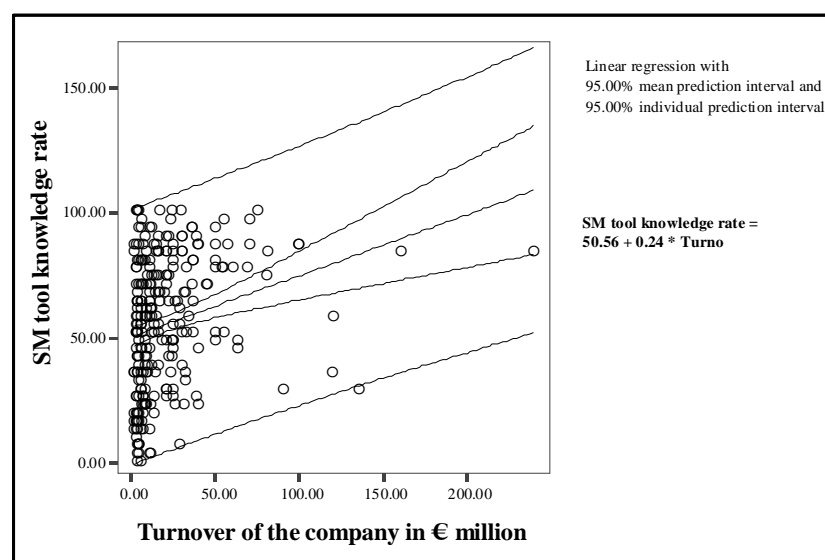


Figure 7.47: Relation company size with SM tool knowledge rate

Source: Developed by researcher

Summary of findings from this sub-section:

- There is a significant relation between strategic management knowledge and the size of the company.

7.10.2 Relation of the company size with strategic management practice

This sections answers research sub-question 6b: What is the relation of the company size with strategic management practice?

In this sub-section, the relation of the company's size with variables related to the strategic management practice is evaluated with the aid of linear regression and ANOVA test. Evaluated variables with a significance level of Sig. ≤ 0.050 are further analysed with a scatter plot.

Table 7.26 lists the results of the analyses with the aid of linear regression. For both models, the null hypothesis is to be rejected in favour of the alternative hypothesis H_1 . The relation of the company size with the application and absorption rate of strategic management tools is significant.

ANOVA(b)						
Model; dependent variable (b)		Sum of squares	df	Mean square	F	Sig.(a)
1. SM tool application rate	Regression	14964.361	1	14964.361	37.811	0.000
	Residual	101317.491	256	395.771		
	Total	116281.853	257			
2. SM tool absorption rate	Regression	2815.119	1	2815.119	4.231	0.041
	Residual	167660.730	252	665.320		
	Total	170475.849	253			
a. Predictor: (Constant), Turnover of the company in € million						

Table 7.26: ANOVA, relation of the company size with various variables (SM application)

Source: Developed by researcher

Figure 7.48 shows the scatter plot for the company size and the strategic management application rate at a 95% confidence interval. The fit lines and equation suggest an increase of the strategic management tool application with the size of the company. This indicates that larger SMEs are, on average, more involved in strategic management as they seem to apply more strategic management knowledge.

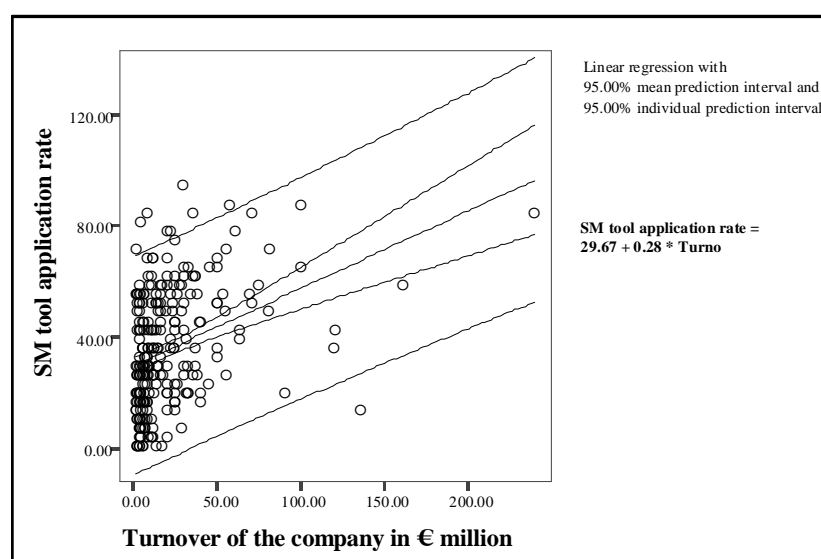


Figure 7.48: Relation company size with SM tool application rate

Source: Developed by researcher

Figure 7.49 shows the scatter plot for the company size and the strategic management absorption rate at a 95% confidence interval. The fit lines and equation suggest an increase of the strategic management tool absorption with the size of the company. Executives of larger SMEs seem to apply more of strategic management knowledge once acquired.

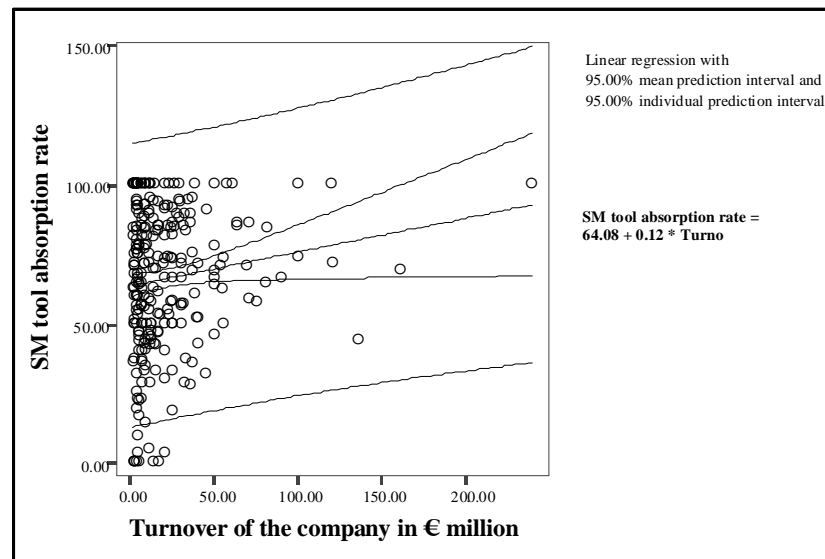


Figure 7.49: Relation company size with SM tool absorption rate

Source: Developed by researcher

Table 7.27 depicts a cross tabulation of the company size in € million turnover and whether strategic planning is carried out or not. A Pearson chi-square test was carried out and it revealed a significant relation (Sig. 0.045). This indicates that smaller SME companies are less inclined to apply the strategic planning process. Over 12% of the SMEs with a turnover of up to € 12.5 million do not apply strategic management at all.

Crosstabulation						
		Turnover of the company in € million				
		0 to 12.50	12.51 to 25.00	25.10 to 50.00	> 50.00	Total
Strategic planning yes or no	Yes	129	53	42	30	254
	No	18	1	1	2	22
Total	Total	147	54	43	32	276
	% No	12.24%	1.85%	2.33%	6.25%	7.97%

Table 7.27: Cross tabulation company size and strategic planning

Source: Developed by researcher

In addition to the analyses above, the following evaluations of relation of the company size with various dependent variables were carried out with the aid of the SPSS “compare means” modelling and the ANOVA table. The analyses did not reveal any significant relation.

- Strategic planning process; Sig. 0.588
- Barriers to strategic management; Sig. 0.648 to 0.953
- Motives to apply the strategic planning process; Sig. 0.809 to 0.964

- Communication of the strategic plan or element thereof; Sig. 0.821 to 0.991
- Execution of the strategic plan; Sig. 0.377 to 0.998
- Improvement of strategic management; Sig. 0.086 to 0.970

Summary of findings from this sub-section:

- There is a significant relation between company size and strategic management tool application rate.
- There is a significant relation between company size and strategic management tool absorption rate.
- There is a significant relation between company size and application of the strategic planning process
- There is no significant relation between company size and other dependent variables, such as the strategic planning process, barriers against it or motives for it, the communication and execution of the strategic plan and improvement of strategic management.

This section has provided answers to research question 6 regarding the relation of the company size with strategic management knowledge and practice. There is evidence of an increase of strategic management knowledge with the sizes of the company. Larger SMEs are on average more involved in strategic management. Evidence indicates that smaller SME companies are less inclined to apply the strategic planning process. No significant relation of the company size with other dependent variables such as type of strategic planning process, barriers, etc. was detected.

The next section goes on to analyse and evaluate research data regarding the relation of company size and R&D effort with company performance outcome.

7.11 Further research results derived from the survey

The following sections discuss research results derived from the survey which are not part of the research questions, but which provide interesting information for the academic community and which suggest further research.

7.11.1 Relation of company size with company performance

In this sub-section, the relation of the company's size with variables pertaining the performance of the company is evaluated with the aid of linear regression and ANOVA test. Evaluated variables with a significance level of Sig. ≤ 0.050 are further analysed with a scatter plot.

Table 7.28 lists the results of the analyses with the aid of linear regression. For model return on sales, equity ratio and R&D, the null hypothesis is proven. There is no relation between the size of the company and these dependent variables.

For models turnover per employee and continuous improvement, rate the null hypothesis is

to be rejected in favour of the alternative hypothesis H_1 . The relation of the size of the company with the evaluated dependent variables is significant.

ANOVA(b)						
Model; dependent variable (b)		Sum of squares	df	Mean square	F	Sig.(a)
1. Turnover per employee	Regression	1249698.893	1	1249698.893	177.133	0.000
	Residual	1862561.845	264	7055.159		
	Total	3112260.738	265			
2. Return on sales	Regression	6.396	1	6.396	0.496	0.482
	Residual	2783.880	216	12.888		
	Total	2790.275	217			
3. Equity ratio	Regression	29.851	1	29.851	0.121	0.729
	Residual	49912.306	202	247.091		
	Total	49942.157	203			
4. R&D ratio	Regression	1.238	1	1.238	0.188	0.665
	Residual	1606.115	244	6.582		
	Total	1607.354	245			
5. Continuous improvement rate	Regression	0.697	1	0.697	5.458	0.021
	Residual	19.786	155	0.128		
	Total	20.483	156			
a. Predictor: (Constant), Turnover of the company in € million						

Table 7.28: ANOVA, relation of the size of the company with various variables

Source: Developed by researcher

Figure 7.50 shows the scatter plot for company size and the turnover per employee at a 95% confidence interval. The fit lines and equation suggest that larger companies generate a higher turnover per employee. Larger SMEs seem to be more efficient.

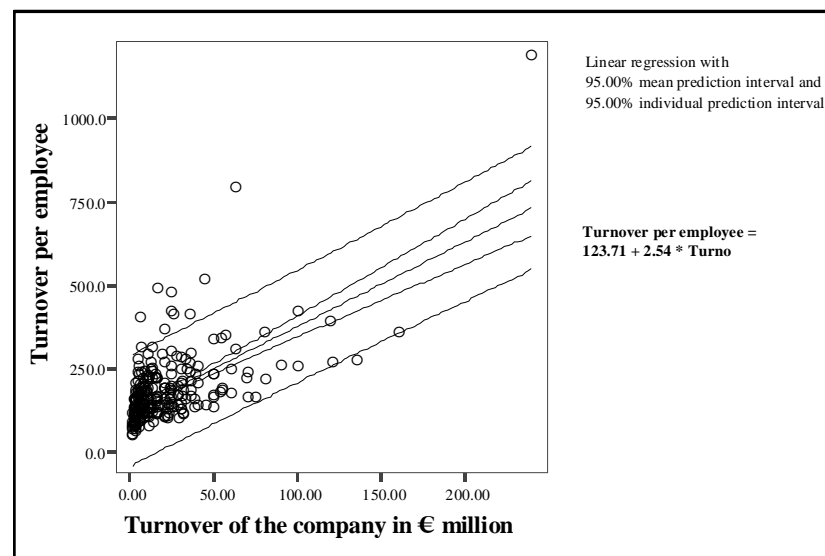


Figure 7.50: Relation of the company size with turnover per employee

Source: Developed by researcher

Figure 7.51 shows the scatter plot for company size and the continuous improvement rate at a 95% confidence interval. The fit lines and equation suggest that the continuous improvement rate declines with the size of the company. Smaller companies seem to be more successful in motivating employees to make suggestions.

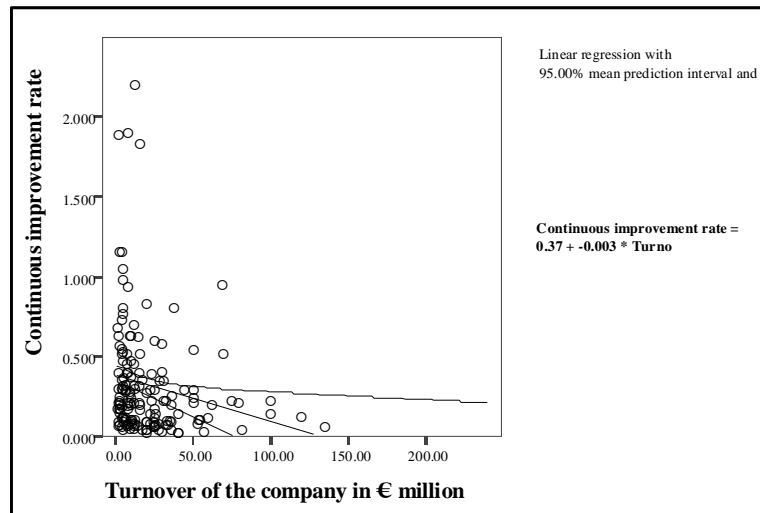


Figure 7.51: Relation of the company size with continuous improvement rate

Source: Developed by researcher

Summary of findings from this sub-section:

- There is a significant positive relation between the company size and turnover per employee.
- There is a significant negative relation between the company size and continuous improvement rate.

7.11.2 Relation of R&D ratio with other company performance indicators

In this sub-section the relation of the R&D ratio with variables pertaining the performance of the company is evaluated with the aid of linear regression and ANOVA test. Evaluated variables with a significance level of $\text{Sig.} \leq 0.050$ are further analysed with a scatter plot.

Table 7.29 lists the results of the analyses with the aid of linear regression. For models turnover per employee and equity ratio the null hypothesis is proven. There is no relation between the R&D ratio and these variables.

For the models return on sales and continuous improvement rate, the null hypothesis is to be rejected in favour of the alternative hypothesis H_1 . The relation of the R&D ratio with the mentioned variables is significant.

ANOVA(b)						
Model; dependent variable (b)		Sum of squares	df	Mean square	F	Sig.(a)
1. Turnover per employee	Regression	1130.286	1	1130.286	0.093	0.761
	Residual	2968395.461	244	12165.555		
	Total	2969525.746	245			
2. Return on sales	Regression	90.328	1	90.328	7.192	0.008
	Residual	2599.653	207	12.559		
	Total	2689.981	208			
3. Equity ratio	Regression	244.460	1	244.460	0.992	0.321
	Residual	48074.322	195	246.535		
	Total	48318.782	196			
4. Continuous improvement rate	Regression	1.809	1	1.809	14.639	0.000
	Residual	18.291	148	0.124		
	Total	20.100	149			
a. Predictor: (Constant), R & D ratio						

Table 7.29: ANOVA, relation of R&D ratio with various variables

Source: Developed by researcher

Figure 7.52 shows the scatter plot for company's R&D ratio and return on sales at a 95% confidence interval. The fit lines and equation suggest that companies investing more in R&D generate more profit.

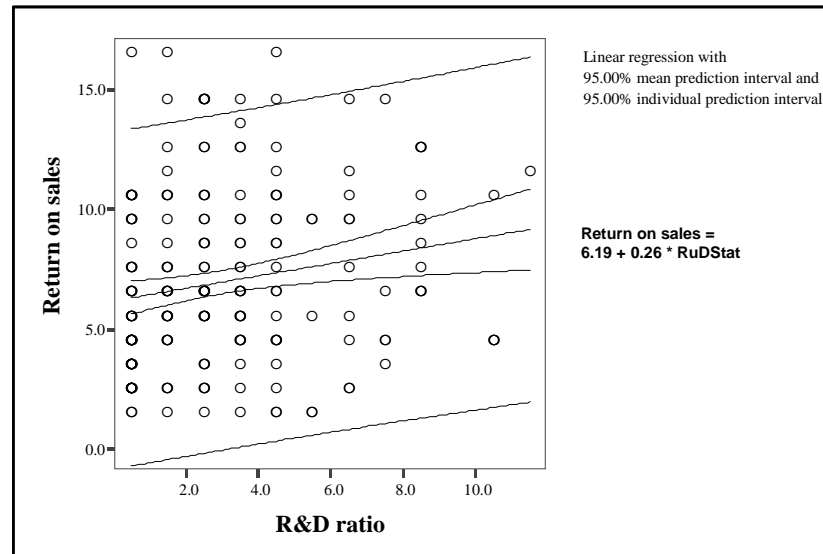


Figure 7.52: Relation of R&D ratio with return on sales

Source: Developed by researcher

Figure 7.53 shows the scatter plot for the company's R&D ratio and the continuous improvement rate at a 95% confidence interval with. The fit lines and equation indicate that companies spending more on R&D are also more inclined to use the benefits of employee suggestions.

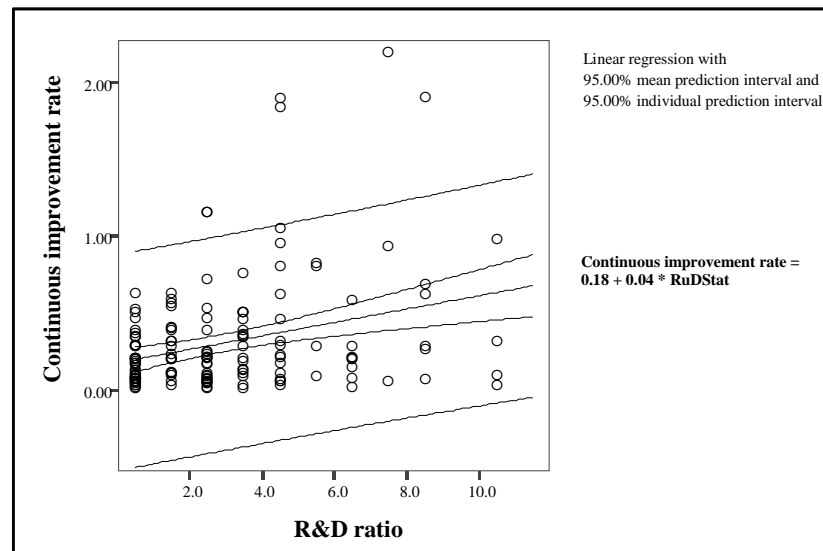


Figure 7.53: Relation of R&D ratio with continuous improvement rate

Source: Developed by researcher

The relation of the continuous improvement rate with the dependable variables return on sales and turnover per employee was investigated by linear regression. No significant relation was discovered (Sig. 0.663 respectively 0.674).

Summary of findings from this sub-section:

- There is a significant relation between the R&D ratio and return on sales.

- There is a significant relation between the R&D ratio and continuous improvement rate.

This section has tested the relation of the company size and R&D effort with the performance outcome. Evidence indicates that larger SMEs are more efficient, but not so successful in motivating employees to make suggestions. There is evidence that companies investing more in R&D generate more profit and are more inclined to use the benefits of employee suggestions.

The next section goes on to discuss qualitative data from the survey, enriched by data from internet sites of the respective company, brochures and annual reports in so called micro case studies.

7.12 Micro case studies of companies responding to the survey

With the survey questionnaire used for this research project, open questions were also raised and answered. These questions are:

- 2.1 What is your perception of strategic management?
- 3.13 What are the company's major challenges within the next two years?
- 3.14 How will you meet these challenges?

With these open questions, qualitative data was collected that allows a closer examination of the executive's and company's way of strategic thinking and acting.

In the following sections, several companies responding to the survey are further analysed and evaluated. The researcher calls these "micro case studies". These micro case studies can be characterised as follows:

- Use of existing qualitative survey data from open questions.
- Use of selected quantitative survey data.
- Enrichment of data by publicly available such as internet sites, brochures and annual reports (published in the Bundesanzeiger = Federal Company Register; Germany).
- Evaluation, visualisation, interpretation, discussion and conclusion of the micro case studies.

The selection process for the micro case studies was carried out as follows:

- Selection of companies who identified themselves in the survey form.
- Definition of the clustering parameters: return on sales and education engineer (Dipl.-Ing.) or business economist (Dipl.-Kfm.); low performer = ROS up to 4.0%, medium performer = ROS 4.1% to 9%, high performer = ROS above 9.0%; the average ROS in the research population is 7.0%.
- Clustering of companies in SPSS Excel export according to parameters above.
- Select typical companies from the individual clusters.

7.12.1 Micro case study; the engineer and low performance

In the following the micro case of a low performing company managed by an engineer is analysed, evaluated and discussed.

General information:

- Case number: 153
- Company number: 4943
- Date response received: 15 November 2008

The executive:

- Gender: Male
- Age: 44
- Education: Dipl.-Ing. and doctoral degree
- Position: managing partner
- Years in position: 2
- Number of strategic management tools acquired: 7
- Number of strategic management tools applied: 5
- Satisfaction with management education: no comments
- Continuing training: exchange of experience; no training day in last five years

The company and its key figures:

- Year founded: 1924
- Legal form: GmbH
- Integration: independent with two subsidiaries
- Branch and products: NACE 29.25; bagging, filling, sealing and handling systems
- Turnover: € 7.8 million
- Number of employees: 68
- Turnover per employee: € 115 thousand (mean in responding population is € 175.6 thousand)
- Return on sales: 1.5% (mean in responding population is 7.0%)
- Equity ratio: 67.5% (mean in responding population is 32.6%)
- R&D ratio: 0.5% (mean in responding population is 3.0%)
- Continuous improvement rate: no continuous improvement system in place
- Anomalies: none

The strategic management praxis:

- Year strategic planning was introduced: no strategic planning carried out

- Strategic planning process: no strategic planning carried out
- Barriers to strategic planning: seen as too complex
- Communication of strategic plan: no strategic planning carried out
- Execution of strategic plan: no strategic planning carried out
- Motives for strategic management: no strategic management applied
- Improvement of strategic management: none

Respondent's statement regarding perception of strategic management:

- *"Have no idea what strategic management is all about".*

Respondent's statement regarding major challenges seen in the next two years:

- *"Recession and depression"*

Respondent's statement regarding measures to cope with these challenges:

- *"Personnel reduction, product "fireworks" > means product development"*

Conclusions (Figure 7.54):

Company 4943 (case 153) is owned and managed by a 44 year old diploma engineer with a doctoral degree. He has held that position for two years.

The company develops and manufactures bagging systems. The company did not do well in 2007, a year with excellent economic opportunities worldwide. The return on sales is 1.5% and far below average. The equity ratio of 67.5% is far above the average of the responding population. Obviously, the company has seen better days. The questions that now emerge are: what caused the low profitability? Has the deterioration to do with the new manager and owner?

Asked for his perception of strategic management, the managing partner states: "Have no idea what strategic management is all about". He acquired 7 and applies 5 of the 31 management tools listed in the questionnaire. Within the last five years, the executive did not spend any days in seminars for continuing training in general management and strategic management. Based on this, it can be strongly assumed that his strategic management knowledge is poor. Consequently, he does not do any strategic planning in his company at all.

The R&D ratio of 0.5% is far below average. The company seems to save money, but in the wrong area. Low investment in R&D will sooner or later result in an unfavourable product portfolio, reduced sales and lower profit. The company is not taking advantage of a continuous improvement programme.

The executive cites recession and depression as the major challenges for the next two years. He answers these with a reduction of personnel and product development. The latter is important, but lay offs should be the last option. Firstly, a sound marketing strategy with market penetration and market development should be selected to maintain or boost sales and profit.

Summary statement:

The whole case suggests that the executive's poor education and knowledge in management leads to the neglect of strategic management and consequently to poor company performance.

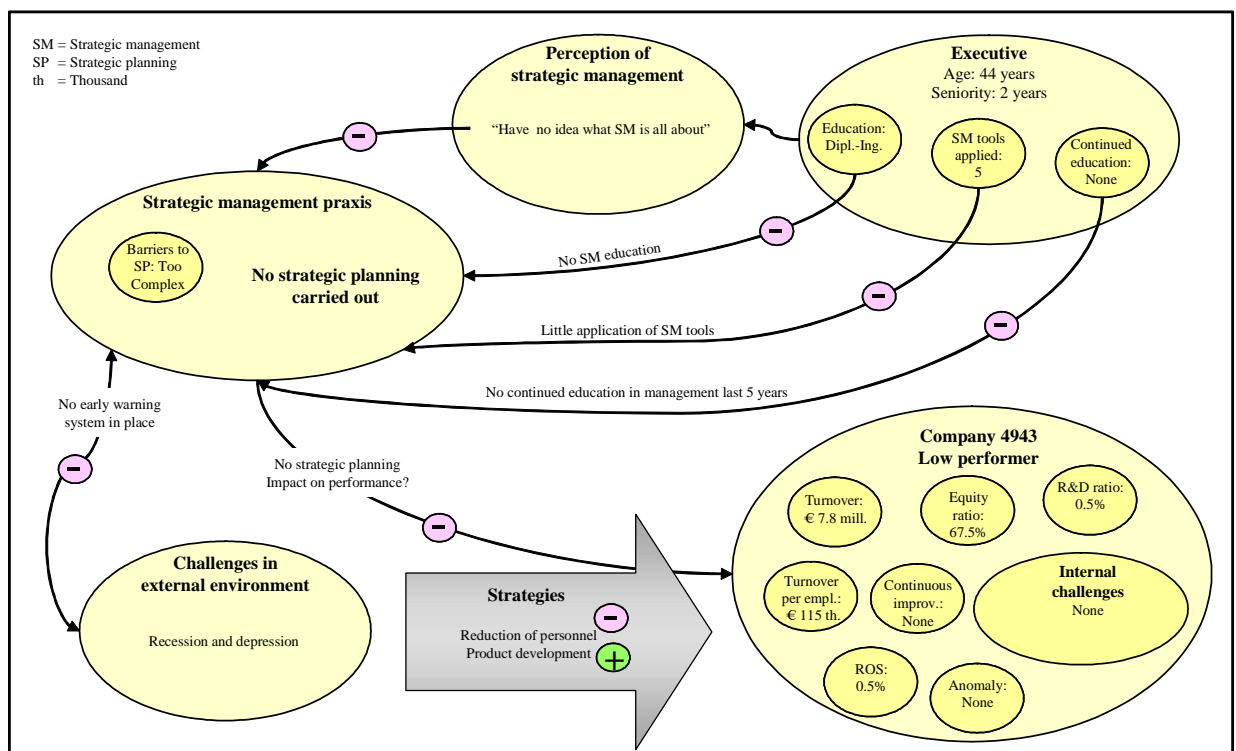


Figure 7.54: Conclusion map, engineer leads low performing company

Source: Developed by researcher

7.12.2 Micro case study; the engineer and medium performance

In the following the micro case of a medium performing company managed by an engineer is analysed, evaluated and discussed.

General information:

- Case number: 17
- Company number: 3462
- Date response received: 17 September 2008

The executive:

- Gender: male
- Age: 37
- Education: Dipl.-Ing. and Facharbeiter (professional)
- Position: managing partner
- Years in position: 10
- Number of strategic management tools acquired: 12

- Number of strategic management tools applied: 4
- Satisfaction with management education: dissatisfied
- Continuing training: seminars; exchange of experience; management journals; 15 training days in last five years

The company and its key figures:

- Year founded: 1971
- Legal form: GmbH & Co. KG
- Integration: independent without subsidiaries
- Branch and products: NACE 29.54; pressing devices for textile industry
- Turnover: € 8.0 million
- Number of employees: 42
- Turnover per employee: € 190.5 thousand (mean in responding population is € 175.6 thousand)
- Return on sales: 6.5% (mean in responding population is 7.0%)
- Equity ratio: 22.5% (mean in responding population is 32.6%)
- R&D ratio: 2.5% (mean in responding population is 3.0%)
- Continuous improvement rate: 0.17% (mean in responding population is 0.30%)
- Anomalies: none

The strategic management praxis:

- Year strategic planning was introduced: 1990
- Strategic planning process: annually and on demand
- Barriers to strategic planning: none
- Communication of strategic plan: available to persons in management positions
- Execution of strategic plan: objectives top down, follow up by external consultant
- Motives for strategic management: important for future success, bank asks for
- Improvement of strategic management: seminars, exchange of experience, external consultant

Respondent's statement regarding perception of strategic management:

- *"Secure company long-term"*

Respondent's statement regarding major challenges seen in the next two years:

- *"Competition Far East; exceed critical size of company"*

Respondent's statement regarding measures to cope with these challenges:

- *"Innovations, cost- conscious production, low fixed costs, branding"*

Conclusions (Figure 7.55):

Company 3462 (case 17) is managed by a 37 year old diploma engineer. He has held that position for ten years.

The company develops and manufactures pressing devices for the textile industry. The return on sales is 6.5%, about the average of the responding population. The equity ratio of 22.5% is below the average but still in an acceptable range. The low equity ratio indicates that the company may have had one or two years with a bottom line loss. This may be the reason, why the bank has asked for a strategic plan and an external consultant for strategic management has been engaged.

Asked for his perception of strategic management, the managing director states: "Secure the company long-term". He also states that he was dissatisfied with management education during his engineering study. He acquired 12 and applies 4 of the 31 management tools listed in the questionnaire. Within the last five years the executive has spent fifteen seminar days for continuing training in general management and strategic management. Based on this, it can be assumed that his management knowledge is satisfactory. The managing director is responsible for strategic management in his company and states that this is important for its future success. Strategic planning, introduced in 1990, is carried out annually and on demand. Key elements of the strategic plan are communicated to all persons in managing positions. A top down system of objectives is in place and activities are followed up by an external consultant. The executive plans to improve strategic management by seminars, exchange of experience with other companies and advice from an external consultant.

The R&D ratio of 2.5% is about average. The company invests sufficient funds in future products and processes and takes advantage of a continuous improvement programme.

The executive cites competition from the Far East as the major challenge for the next two years. He answers with the following strategies: innovation in products and services, cost management and branding. Innovation keeps the competitors at a technological distance. Cost management and consciousness has a positive impact on competitiveness and profit. Branding is an important marketing tool and may increase brand awareness and sales.

Summary statement:

In this micro case study, the company is managed by an engineer who acquired knowledge in general management and strategic management through seminars. Strategic planning is carried out with the aid of an external consultant who also follows it up. The strategies selected are in line with the challenges ahead. The company is doing well.

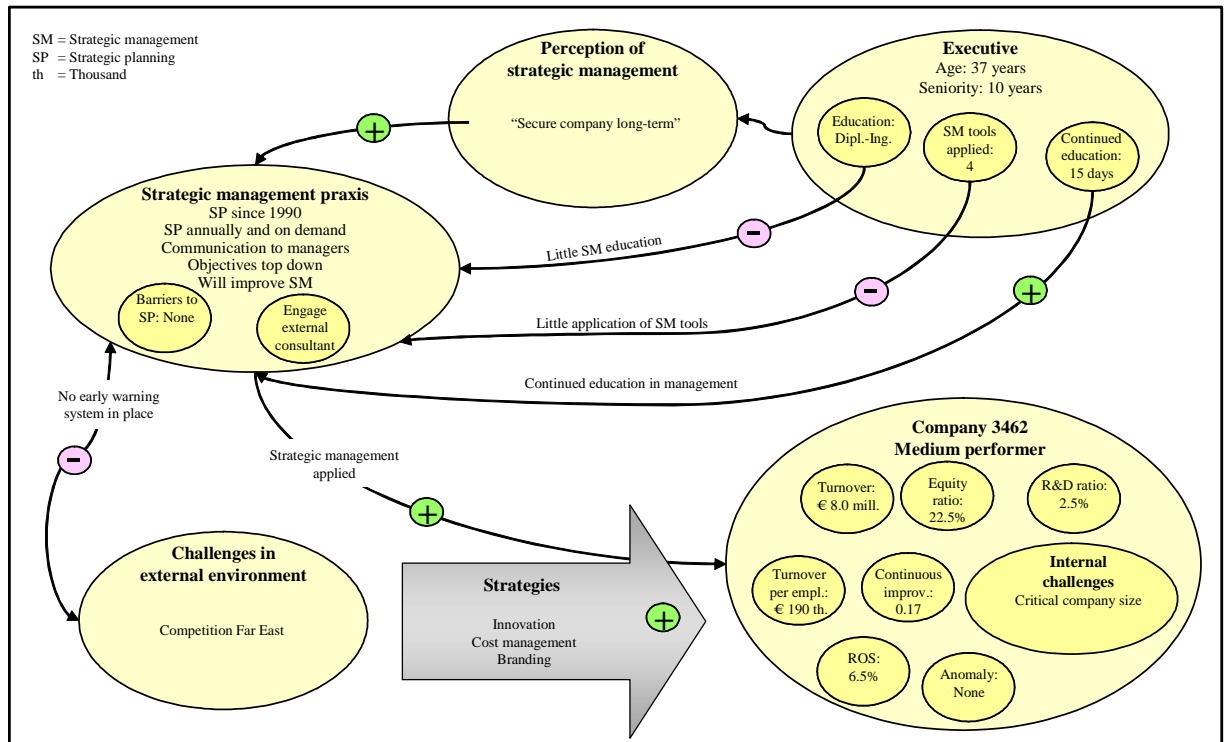


Figure 7.55: Conclusion map, engineer leads medium performing company

Source: Developed by researcher

7.12.3 Micro case study; the engineer and high performance

In the following the micro case, a high performing company managed by an engineer is analysed, evaluated and discussed.

General information:

- Case number: 157
- Company number: 5136
- Date response received: 15 November 2008

The executive:

- Gender: male
- Age: 60
- Education: Dipl.-Ing. and Facharbeiter (professional)
- Position: managing partner
- Years in position: 8
- Number of strategic management tools acquired: 12
- Number of strategic management tools applied: 6
- Satisfaction with management education: dissatisfied
- Continuing training: seminars; 42 training day in last five years

The company and its key figures:

- Year founded: 1951
- Legal form: GmbH
- Integration: independent without subsidiaries
- Branch and products: NACE 29.13; valves and seals
- Turnover: € 9.4 million
- Number of employees: 53
- Turnover per employee: € 177.4 thousand (mean in responding population is € 175.6 thousand)
- Return on sales: 14.5% (mean in responding population is 7.0%)
- Equity ratio: 32.5% (mean in responding population is 32.6%)
- R&D ratio: 2.5% (mean in responding population is 3.0%)
- Continuous improvement rate: 0.13% (mean in responding population is 0.30%)
- Anomalies: none

The strategic management praxis:

- Year strategic planning was introduced: 2003
- Strategic planning process: annually and on demand
- Barriers to strategic planning: none
- Communication of strategic plan: persons in managing positions, equity owners, major creditors, major customers, major suppliers
- Execution of strategic plan: follow up in strategy meetings
- Motives for strategic management: important for future success
- Improvement of strategic management: seminars, provision of literature

Respondent's statement regarding perception of strategic management:

- *"Formulate objectives in all areas of the company and alignment to these objectives; check feasibility; develop vision and make this to objective"*

Respondent's statement regarding major challenges seen in the next two years:

- *"Further new products; internationalisation; increase turnover"*

Respondent's statement regarding measures to cope with these challenges:

- *"Recruit personnel for technology and sales; acquire company; improve IT-application"*

Conclusions (Figure 7.56):

Company 5136 (case 157) is owned and managed by a 60 year old engineer, who has held that position for 8 years.

The company develops and manufactures valves and seal for all kind of industrial

applications. The return on sales is 14.5%, far above the average of the responding population. The equity ratio of 32.5% is at average level. The company is doing very well.

Asked for his perception of strategic management, the managing partner mentions important elements of strategic planning such as creating a vision, deciding objectives and aligning all areas of the company. He states that, during his engineering study, he was dissatisfied with his management education. He acquired 12 and applies 6 of the 31 management tools listed in the questionnaire. Within the last 5 years the executive has spent 42 seminar days for continuing training in general management and strategic management. Based on this, it can be assumed that his management knowledge in general management and strategic management is quite good. The managing partner is responsible for strategic management in his company and he states that this is important for the future success of the company. Strategic planning, introduced in 2003, is carried out annually and on demand. Key elements of the strategic plan are communicated to everyone in managing positions and to equity owners. The activities from the strategic plan are followed up in strategy meetings. The executive plans to improve strategic management by seminars and provision of literature.

The R&D ratio of 2.5% is about average. The company is investing sufficient funds in future products and processes and is taking advantage of a continuous improvement programme.

The executive cites internationalisation as the major challenge for the next two years. This is actually a strategy to meet market share or growth objectives. Further strategies are: product development, personnel recruitment, external growth through the acquisition of a company and the improvement of the information technology landscape in the company.

Summary statement:

In this micro case study the company is managed by an engineer who has extensively acquired education in general management and strategic management through seminars. Strategic planning is carried out annually and on demand. The strategies selected are geared to sustain the current success, to grow the company and to increase its value. The company is doing very well.

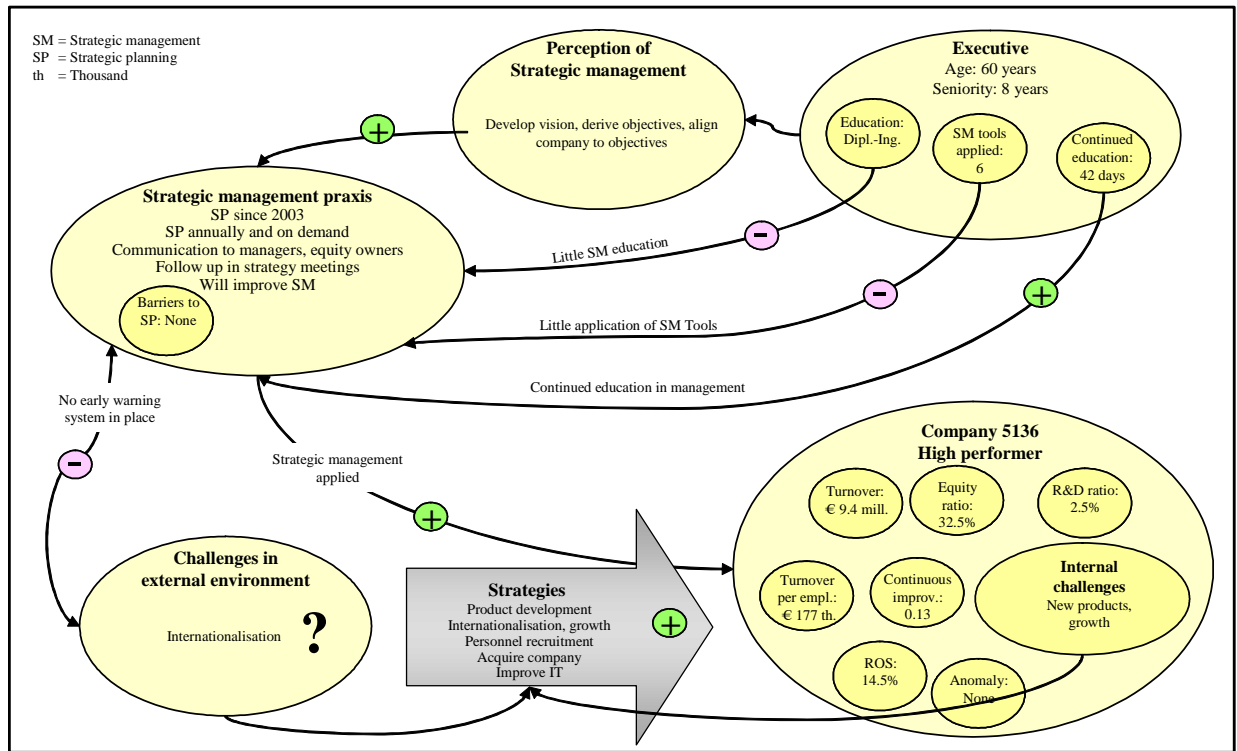


Figure 7.56: Conclusion map, engineer leads high performing company

Source: Developed by researcher

7.12.4 Micro case study; the business economist and low performance

In the following the micro case of a low performing company managed by a business economist is analysed, evaluated and discussed.

General information:

- Case number: 58
- Company number: 4579
- Date response received: 24 September 2008

The executive:

- Gender: male
- Age: 46
- Education: Dipl.-Kfm. and industrial clerk
- Position: managing partner
- Years in position: 5
- Number of strategic management tools acquired: 20
- Number of strategic management tools applied: 16
- Satisfaction with management education: satisfied
- Continuing training: seminars. exchange of experience; 10 training day in last five years

The company and its key figures:

- Year founded: 1987
- Legal form: GmbH
- Integration: independent without subsidiaries
- Branch and products: NACE 29.43; machine tools for turning and drilling
- Turnover: € 3,5 million
- Number of employees: 24
- Turnover per employee: € 145.8 thousand (mean in responding population is € 175.6 thousand)
- Return on sales: 1.5% (mean in responding population is 7.0%)
- Equity ratio: 12.5% (mean in responding population is 32.6%)
- R&D ratio: 4.5% (mean in responding population is 3.0%)
- Continuous improvement rate: no continuous improvement system in place
- Anomalies: restructuring, downsizing; -10% on profit

The strategic management praxis:

- Year strategic planning was introduced: 1998
- Strategic planning process: annually in combination with operative planning
- Barriers to strategic planning: none
- Communication of strategic plan: persons in managing positions, major creditors
- Execution of strategic plan: follow up in management meetings and by external consultant, use of key figure tables
- Motives for strategic management: important for future success
- Improvement of strategic management: seminars, exchange of experience, provision of literature, engaging external consultant

Respondent's statement regarding perception of strategic management:

- *"Keep the company on course in all areas"*

Respondent's statement regarding major challenges seen in the next two years:

- *"Develop new customers, also outside Germany in neighbouring countries and Europe-wide; fair presence in France 2010"*

Respondent's statement regarding measures to cope with these challenges:

- *"Fair presence in Leipzig Intec Techno 2009 and France Simodec 2010"*

Conclusions (Figure 7.57):

Company 4579 (case 58) is owned and managed by a 46 year old business economist, who has held that position for five years.

The company develops and manufactures machine tools for turning and drilling. The return on sales is 1.5%, far below the average of the responding population. The equity ratio of 12.5% is also far below the average and in a dangerous range. The low equity ratio indicates that the company has had one or some years with a bottom line loss. This may be the reason why the company has engaged an external consultant for strategic management, restructuring and down sizing.

Asked for his perception of strategic management, the managing partner provides a general statement: "Keep company on course in all areas". Regarding his management education during his study as a Dipl.-Kfm. he states that he was satisfied. He acquired 20 and applies 16 of the 31 management tools listed in the questionnaire. Within the last 5 years the executive has spent ten seminar days for continuing training in general management and strategic management. Based on this, it can be assumed that his knowledge in general management and strategic management is satisfactory. The managing partner is responsible for strategic management in his company. He states that this is important for the future success of the company. Strategic planning, introduced in 1998, is carried out annually in combination with operative planning. Key elements of the strategic plan are communicated everyone in managing positions and to major creditors. Activities from the strategic plan are followed up in management meetings. Controlling is carried out with the aid of key figure tables. The executive plans to improve strategic management by seminars, exchange of experience with other companies, provision of literature and advice from an external consultant.

The R&D ratio of 4.5% is above average. The company invests sufficient funds in future products and processes, but does not take advantage of a continuous improvement programme.

The executive lists market development, internationalisation, marketing and sales as the major challenges for the next two years. These are actually strategies to meet market share or growth objectives. The executive claims to have an early warning system in place for the external environment. Based upon the statements, the executive provided on challenges, this can be questioned. The forthcoming economic crisis and the competition from the Far East that challenge German manufacturers of standard machine tools are not mentioned. The company probably hired the external consultant to help out in restructuring and improvement in marketing. This assumption is supported by the fact that the company's internet site is in German language only. It is likely that not enough effort was put into internationalisation and, in particular, market development outside Germany. The fact that the company had to downsize in 2007 is also evidence of poor strategic and operative marketing. Very likely, the company has lost market share.

Summary statement:

In this micro case study the company is managed by a business economist with sufficient education in general management. The question is, whether he is also familiar with the art of strategic management and strategic planning. Some evidence described above (lack of internationalisation, early warning that neglects challenges from the Far East) support the

assumption that he is not familiar enough and strategic planning lacks quality. This and the fact that the company is doing badly, may be the reason for engaging an external consultant.

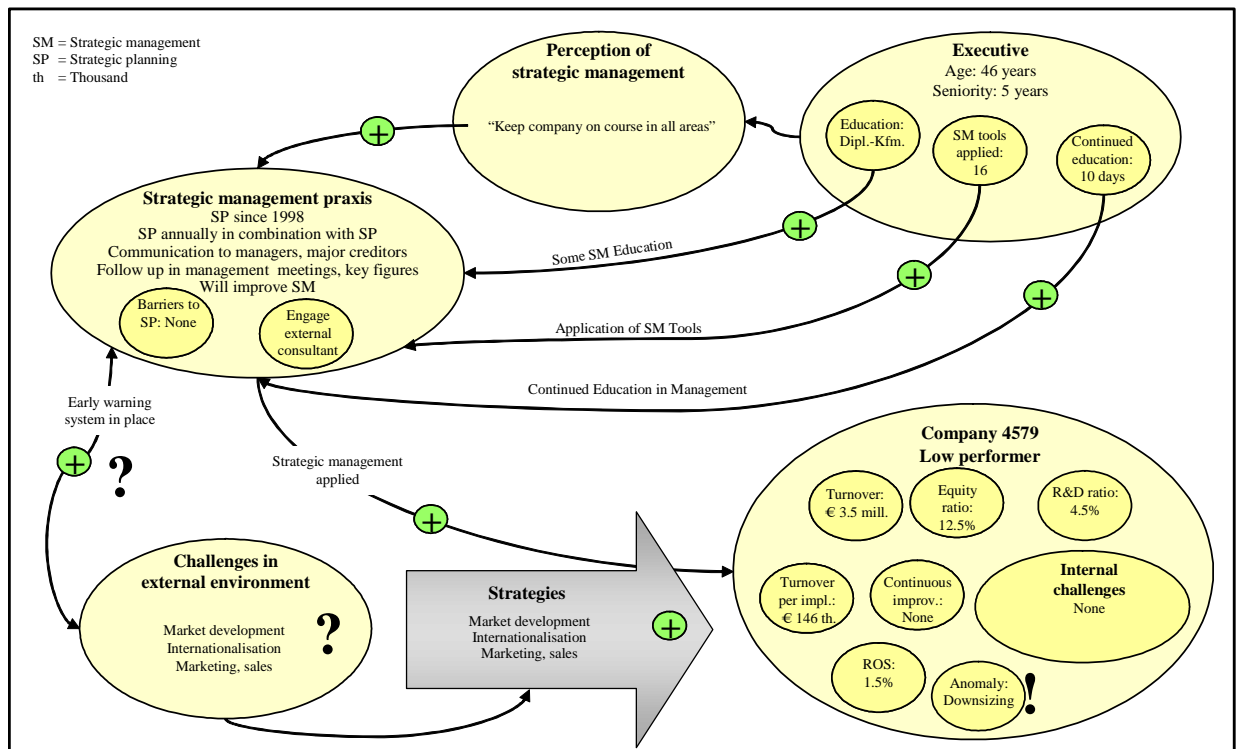


Figure 7.57: Conclusion map, business economist leads low performing company

Source: Developed by researcher

7.12.5 Micro case study; the business economist and medium performance

In the following, the micro case of a medium performing company, managed by a business economist is analysed, evaluated and discussed.

General information:

- Case number: 163
- Company number: 4955
- Date response received: 17 November 2008

The executive:

- Gender: male
- Age: 35
- Education: Dipl.-Kfm.
- Position: managing partner
- Years in position: 8
- Number of strategic management tools acquired: 20
- Number of strategic management tools applied: 17

- Satisfaction with management education: satisfied
- Continuing training: seminars, exchange of experience, management books and journals, internet downloads; 30 training days in last five years

The company and its key figures:

- Year founded: 1924
- Legal form: GmbH
- Integration: independent without subsidiaries
- Branch and products: NACE 29.56; accessories for printing machines, special machines
- Turnover: € 3.2 million
- Number of employees: 52
- Turnover per employee: € 61.5 thousand (mean in responding population is € 175.6 thousand)
- Return on sales: 5.5% (mean in responding population is 7.0%)
- Equity ratio: 27.5% (mean in responding population is 32.6%)
- R&D ratio: 2.5% (mean in responding population is 3.0%)
- Continuous improvement rate: 0.23% (mean in responding population is 0.30%)
- Anomalies: extra asset write offs

The strategic management praxis:

- Year strategic planning was introduced: 2000
- Strategic planning process: annually in combination with operative planning
- Barriers to strategic planning: none
- Communication of strategic plan: to all employees, major creditors, major customers
- Execution of strategic plan: follow up in management meetings
- Motives for strategic management: important for future success
- Improvement of strategic management: seminars, exchange of experience, provision of literature

Respondent's statement regarding perception of strategic management:

- *"Leading the company regarding medium term and long term development"*

Respondent's statement regarding major challenges seen in the next two years:

- *"Transfer several new customers with high potential in a stable partnership; increase advertisements to get more trainees; increase EBIT to >10%"*

Respondent's statement regarding measures to cope with these challenges:

- *“Mobilise employees; advertisement at schools (recruitment); cost reduction; increase turnover”*

Conclusions (Figure 7.58):

Company 4955 (case 163) is owned and managed by a 35 year old business economist, who has held that position for eight years.

The company develops and manufactures accessories for printing machines as well as special machines in the printing sector. The return on sales is 5.5%, about the average of the responding population. The equity ratio of 27.5% is also about average.

Asked for his perception of strategic management, the managing partner states: “Leading the company regarding medium-term and long-term development”. During his study as a Dipl.-Kfm. he states that he was satisfied with his management education. He acquired 20 and applies 17 of the 31 management tools listed in the questionnaire. Within the last five years, the executive has spent thirty seminar days for continuing training in general management and strategic management. Based on this, it can be assumed that his knowledge in general management and strategic management is sufficient. The managing partner is responsible for strategic management in his company. He states that this is important for its future success. Strategic planning, introduced in 2000, is carried out annually in combination with operative planning. Key elements of the strategic plan are communicated to all employees, to major creditors and major customers. Activities from the strategic plan are followed up in management meetings. The executive plans to improve strategic management by seminars, exchange of experience with other companies, provision of literature.

The R&D ratio of 2.5% is about average. The company is investing sufficient funds in future products and processes and is taking advantage of a continuous improvement programme.

The executive lists the following major challenges for the next two years: turning customers into stable partners, recruitment of trainees and profitability. These are actually strategies to maintain the market share, to prepare for growth and to create sustained success. The executive claims to have an early warning system in place for the external environment. Based upon the statements which the executive provided on challenges, this can be questioned. Future economic crisis is not mentioned as a challenge. The executive returned the questionnaire in mid November 2008 and, by that time, economic crisis was evident. Personnel recruitment is usually not the favoured strategy in a crisis situation. Other strategies listed are market development, mobilisation of employees and cost management which are appropriate for this company. Marketing in general, however, seems to be an issue. One indication for that is the internet site which is in German language only. This is unusual for an exporting company and is either a sign of lack of customer orientation or little internationalisation. Other likely evidence of sub-optimal marketing is the fact that the company had to write off assets in 2007. In many cases, write offs have to be made for obsolete and unsaleable finished products.

Summary statement:

In this micro case study, the company is managed by a business economist with sufficient management education. The company is doing well but there is room for the improvement of the strategic planning process, the profitability and sustained success.

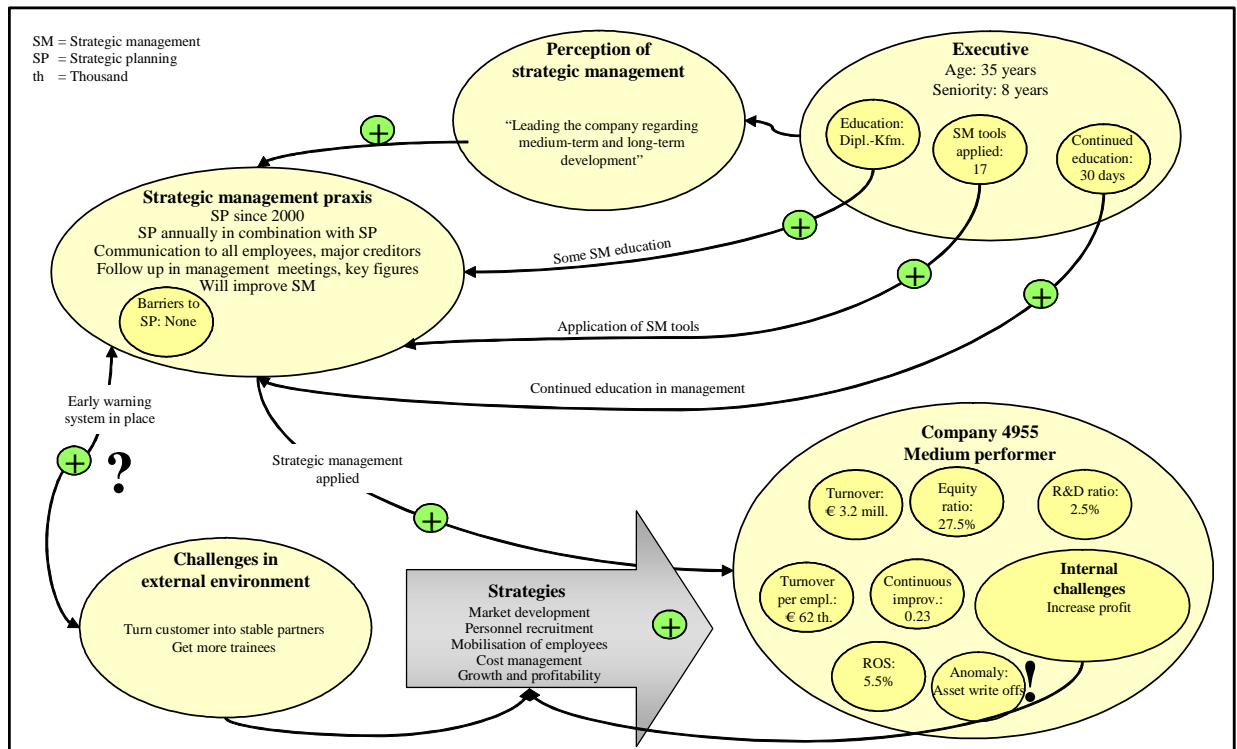


Figure 7.58: Conclusion map, business economist leads medium performing company

Source: Developed by researcher

7.12.6 Micro case study; the business economist and high performance

In the following, the micro case of a high performing company managed by a business economist is analysed, evaluated and discussed.

General information:

- Case number: 204
- Company number: 1987
- Date response received: 25 November 2008

The executive:

- Gender: male
- Age: 58
- Education: Dipl.-Kfm. and industrial clerk
- Position: managing director
- Years in position: 10

- Number of strategic management tools acquired: 31
- Number of strategic management tools applied: 18
- Satisfaction with management education: satisfied
- Continuing training: management books and journals; 6 training days in last five years
- Anomalies: none

The company and its key figures:

- Year founded: 1998
- Legal form: GmbH
- Integration: independent without subsidiaries
- Branch and products: NACE 29.14; clutches, brakes, hydraulic units
- Turnover: € 75 million
- Number of employees: 480
- Turnover per employee: € 156.3 thousand (mean in responding population is € 175.6 thousand)
- Return on sales: 11.5% (mean in responding population is 7.0%)
- Equity ratio: 52.5% (mean in responding population is 32.6%)
- R&D ratio: 6.5% (mean in responding population is 3.0%)
- Continuous improvement rate: 0.21% (mean in responding population is 0.30%)

The strategic management praxis:

- Year strategic planning was introduced: 1995
- Strategic planning process: annually and on demand
- Barriers to strategic planning: none
- Communication of strategic plan: to all employees
- Execution of strategic plan: follow up in management meetings
- Motives for strategic management: important for future success
- Improvement of strategic management: seminars, provision of literature

Respondent's statement regarding perception of strategic management:

- *"Development of product and market strategies"*

Respondent's statement regarding major challenges seen in the next two years:

- *"Management during financial crisis"*

Respondent's statement regarding measures to cope with these challenges:

- *"Maintain / improve liquidity; additional sales activities; strong cost controlling"*

Conclusions (Figure 7.59):

Company 1987 (case 204) is managed by a 58 year old business economist. He has held that position for ten years.

The company develops and manufactures brakes, clutches and hydraulic units for all business applications. The return on sales is 11.5%, far above the average of the responding population. The equity ratio of 52.5% is also far above average.

Asked for his perception of strategic management, the managing partner states: "Development of product and market strategies". During his study as a Dipl.-Kfm. he states that he was satisfied with his management education. He acquired 31 and applies 17 of the 31 management tools listed in the questionnaire. Within the last five years, the executive has spent six seminar days for continuing training in general management and strategic management. He is one of the few executives who have acquired all 31 strategic management tools during his study or in seminars. Based on this, it can be assumed that his knowledge in general management and strategic management is excellent. The managing director is responsible for strategic management in his company. He states that this is important for the future success of the company. Strategic planning, introduced in 1995, is carried out annually and on demand. Key elements of the strategic plan are communicated to all employees. Activities from the strategic plan are followed up in management meetings. The executive plans to improve strategic management by seminars and provision of literature.

The R&D ratio of 6.5% is far above average. The company is investing heavily in products and processes and is taking advantage of a continuous improvement programme.

The executive cites the management of the financial crisis as the major challenge for the next two years. He selects the following measures and strategies to cope with these challenges: maintain and improve liquidity; additional sales activities and strong cost controlling.

Summary statement:

In this micro cases study the company is managed by a business economist with an excellent education in general management and strategic management. The company is doing very well from all perspectives. Return on sales is high and allows substantial investments in R&D. The equity ratio is high and the company is less vulnerable in an economic crisis. A large part of its success may be ascribed to the managing director's sound management education and his application of strategic management.

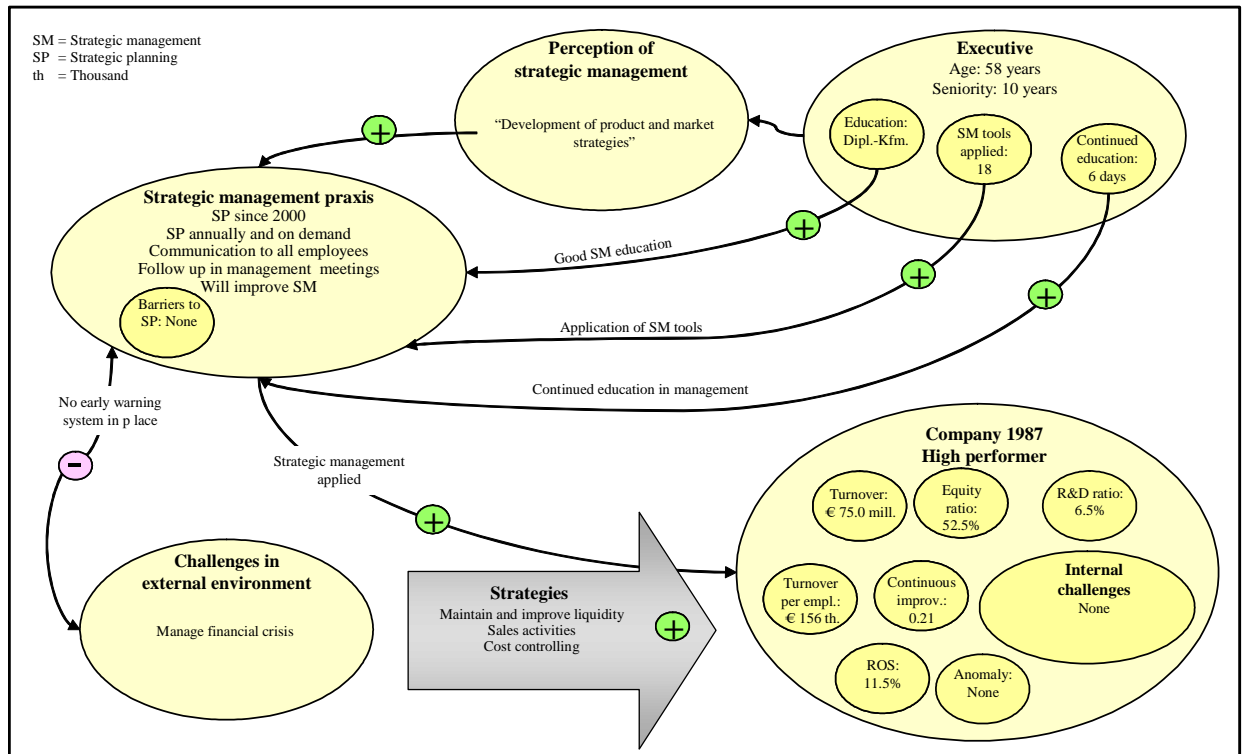


Figure 7.59: Conclusion map, business economist leads high performing company

Source: Developed by researcher

7.12.7 Summary of micro case studies

Based upon the comprehensive quantitative, and also qualitative information, provided by the respondents, so called micro case studies could be prepared for virtually all responses. The researcher selected six typical cases that were discussed in the sections above.

Table 7.30 lists the management tools in the phases of strategic management acquired and applied by the top executives in the six micro cases. It is evident that engineers have little management knowledge in comparison with business economists, which indicates the lack of management education in German engineering faculties. The list also shows that engineers' management knowledge and application is more focused on the functional areas and less on the strategic planning elements analysis, strategic premises and strategy formulation. Furthermore, the list shows that companies with high performance are lead by top executives with a higher rate of management knowledge and application which supports evidence that management education and strategic practice positively impact company performance.

Table 7.31 briefly summarises the micro case studies and links to the outcome of the quantitative analysis. The low performing company led by an engineer has no strategic planning process in place. The strategic planning process of the low performing company led by a business economist lacks quality as qualitative information suggests. Both micro cases provide evidence which supports the view that the lack of strategic management leads to the business's underperformance; or, in other words, that strategic practice positively impacts upon a company's performance.

Phase of strategic management	No	Strategic management tool	Case Engin. Low perform.		Case Engin. Med. perform.		Case Engin. High perform.		Case Bus.Ec. Low perform.		Case Bus.Ec. Med. perform.		Case Bus.Ec. High perform.	
			Acqu.	Appl.	Acqu.	Appl.	Acqu.	Appl.	Acqu.	Appl.	Acqu.	Appl.	Acqu.	Appl.
Strategic analysis and assessment	1	Benchmarking			1	1	1	1			1	1	1	1
	2	SWOT											1	1
	3	Five competitive forces (Porter)											1	
	4	Scenario technique							1	1	1	1	1	
Strategic premises and settings	5	Vision					1	1	1	1	1	1	1	1
	6	Mission statement									1	1	1	1
	7	Corporate identity programme			1	1	1	1	1	1	1		1	1
Strategy formulation	8	BCG growth-share matrix			1		1		1		1	1	1	
	9	Attractiveness-business-strengths matrix			1		1		1				1	
	10	Market-life-cycle-compet.-strength matr.			1				1	1	1	1	1	
	11	Product market grid (Ansoff)											1	
	12	Strategy maps											1	
	13	Quality management ISO 9000			1		1	1	1	1	1	1	1	1
Functional areas	Operations strategy	14	TQM (total quality management)		1		1		1	1			1	1
		15	EFQM model			1							1	
		16	Six sigma	1					1	1			1	
		17	Supply chain management	1	1	1		1	1	1	1		1	1
	HR strategy	18	Continuous improvement programme	1	1	1	1	1	1	1	1	1	1	1
		19	Skill management										1	
		20	Change management				1	1	1	1	1	1	1	1
	Marketing strategy	21	Market segment./different./position.	1	1				1	1	1	1	1	1
		22	Marketing mix (Kotler, 4 Ps)						1	1			1	1
		23	Key account management			1	1	1	1		1	1	1	1
	R&D strategy	24	Innovation management	1					1	1	1	1	1	1
		25	Knowledge management	1	1				1	1			1	
	Finance strategy	26	Overhead value analysis								1	1	1	1
		27	Zero base budgeting								1	1	1	
Strategy execution and controlling	28	Activity database	1	1					1		1	1	1	1
	29	Balanced scorecards											1	1
	30	Risk management system			1		1		1	1	1	1	1	1
	31	Early warning system							1	1	1	1	1	
Number of tools in strategic analysis			0	0	1	1	1	1	1	1	2	2	4	2
Number of tools in strategic premises and setting			0	0	1	1	2	2	2	2	3	2	3	3
Number of tools in strategy formulation			0	0	3	0	2	0	3	1	2	2	5	0
Number of tools in functional areas			6	4	6	2	6	3	11	10	10	8	15	10
Number of tools in strategy execution and controlling			1	1	1	0	1	0	3	2	3	3	4	3
Number of tools total			7	5	12	4	12	6	20	16	20	17	31	18

Engin. = Engineer; Bus.Ec. = Business economist; Perform. = Performance; Med. = Medium; Acqu. = Acquired; Appl. = Applied

Table 7.30: Strategic management tools acquired and applied

Source: Developed by researcher

No.	Education	Age	Seniority	SM tools known/applied	SM since	SP process	Performance	Summarising comment	Link to survey outcomes	
1	Engineer	44	2	7 / 5	no SM	no SP	low	neglect SM >> poor performance; low R&D ratio	7.5.3; 7.6.2 Engineers low SM knowledge and application	7.7.3 Relation SM practice and ROS 7.11 Relation of R&D ratio with ROS
2	Engineer	37	10	14 / 4	1990	annually + demand	medium	SP carried out >> good performance		7.7.3 Relation SM practice and ROS
3	Engineer	60	8	12 / 6	2003	annually + demand	high	SP carried out >> very good performance		7.7.3 Relation SM practice and ROS
4	Bus. econ.	46	5	20 / 16	1998	annually with OP	low	restructuring, doubt about quality of SP >> poor performance >> external consultant	7.5.3; 7.6.2 Business economists high SM knowledge and application	7.6.6 Doubt regarding quality of SP
5	Bus. econ.	35	8	20 / 17	2000	annually with OP	medium	SP carried out >> good performance		7.7.3 Relation SM practice and ROS
6	Bus. econ.	58	10	31 / 18	1995	annually + demand	high	SP carried out >> very good performance; R&D ratio far above average		7.7.3 Relation SM practice and ROS 7.11 Relation of R&D ratio with ROS

Bus. econ. = Business economist; SM = Strategic management; SP = Strategic planning; OP = Operative planning

Table 7.31: Summary of micro case studies

Source: Developed by researcher

7.13 Summary

This chapter began with a description of the data handling in SPSS and in the Hoppenstedt database, information regarding the responding companies and an evaluation of the non-response bias. The latter revealed that there is no significant bias of the responding population compared to the non-responding population.

The chapter continues with the explanation of the descriptive and inference statistics and hypothesis testing, followed by basis demographics of the respondents and companies such as education, seniority, or turnover. About 91.5% of the respondents are managing partners or directors, the decision makers of the companies. Around 42% of the executives have an engineering degree.

The sections following provide answers to the research questions raised. One section provides evaluations regarding the state of management education in the research sector. More strategic management knowledge is acquired through seminars or via self-study, a fact that indicates the lack of management education in German universities. The average strategic management knowledge rate of 55.2% appears low for top executives.

The section on relation of education with knowledge acquisition provides evidence of the lack of strategic management knowledge of engineers in managing positions. The main reason for this is the neglect of management education in the engineering faculties of German universities.

Responding engineers complain about the lack of management education at university and suggest including strategic management in the curricula. Some business economists and MBAs criticise the lack of praxis orientation, or lack of case study work, in management education.

Continuing management education plays an important role as most of the strategic management knowledge is acquired through seminars and self-study. Executives in the research sector have spent on average about 16 days on continuing management education in seminars.

On average, 36.6% of the strategic management tools are applied by the responding executives. This relates to the lack of strategic management knowledge. There is evidence that few engineers apply strategic management tools. The low rate of marketing tool application of engineers is remarkable.

On average, the strategic planning process was introduced in 1998. Over 92% of the responding companies claim to do strategic planning. However, there are questions about the quality of the strategic planning process in the research sector. Some executives see the strategic planning process as too complex and theoretical. About 20% of the responding companies engage external consultants for the improvement of strategic management.

The chapter continues with the evaluation of the executive's perception of strategic management, their assessment of major challenges they see ahead of the company and the measures they plan to take.

In the section, testing the relation of the type of education with performance outcome, evidence suggests that engineers may generate a lower rate of return on sales and pay more attention to innovation.

There is evidence that companies generate more profit if they introduce strategic planning at an early stage. Companies who apply a higher rate of strategic management tool put more emphasis on innovation. There is some evidence that companies applying certain strategic management tools are, on average, more efficient or profitable.

Age and seniority of the executives is related to some dependent variables. Older executives or those with a more seniority fail to keep their management knowledge up to date. But, there is evidence that executives, who have held their position for longer, generate a higher return on sales and equity ratio and pay more attention to innovation. There is evidence that executives with a technical background or who have studied engineering, on average, stay longer in their management position than those with other educational qualifications.

The relation of the company size with other dependent variables was also investigated. Larger SMEs are, on average, more involved in strategic management and apply a higher rate of management tools. There is evidence that smaller SMEs seem to be more successful in motivating employees to make suggestions.

The evidence suggesting that companies investing more in R&D generate more profit and are more inclined to use the benefits of employee suggestions is noteworthy.

Chapter 7 concludes with six micro case studies of companies, each led by engineers or business economists with low, medium and high performance. There is supporting evidence that lack of management education leads to the neglect of management practices and subsequently to low performance.

Figure 7.60 summarises the issues and conclusions drawn, the contribution to the research project made with this chapter and results and lessons learned.

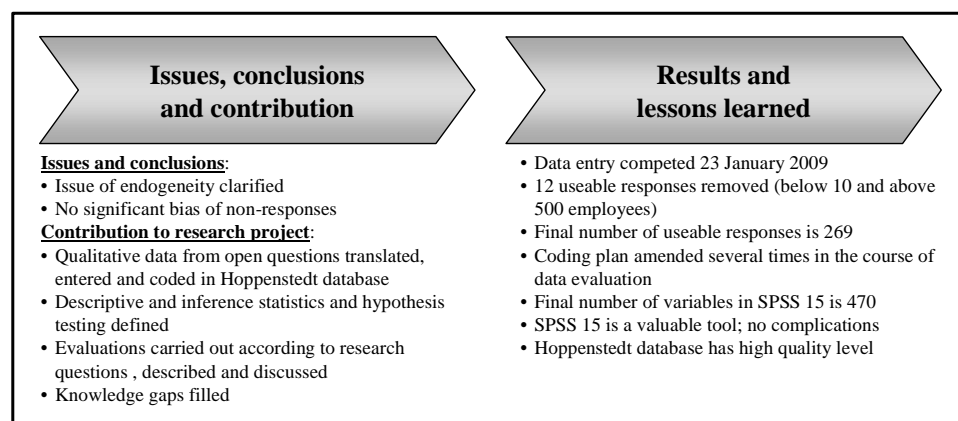


Figure 7.60: Chapter contribution and summary

Source: Developed by researcher

The next chapter goes on to the conclusion of this research, recommendations and opportunities for further research.

8 Conclusions, recommendations and opportunities for further research

“You cannot teach anything to a person, you can only help the person to discover it for himself”

Galileo Galilei (Quoted in Handelsblatt, 2005, p. 48)

8.1 Introduction

Chapter 7 has provided comprehensive analyses derived from the survey data received and in accordance with the research questions. The gaps in knowledge were identified and addressed and new knowledge and theories were created while existing ones were complemented.

Figure 8.0 lists the objectives for this chapter.

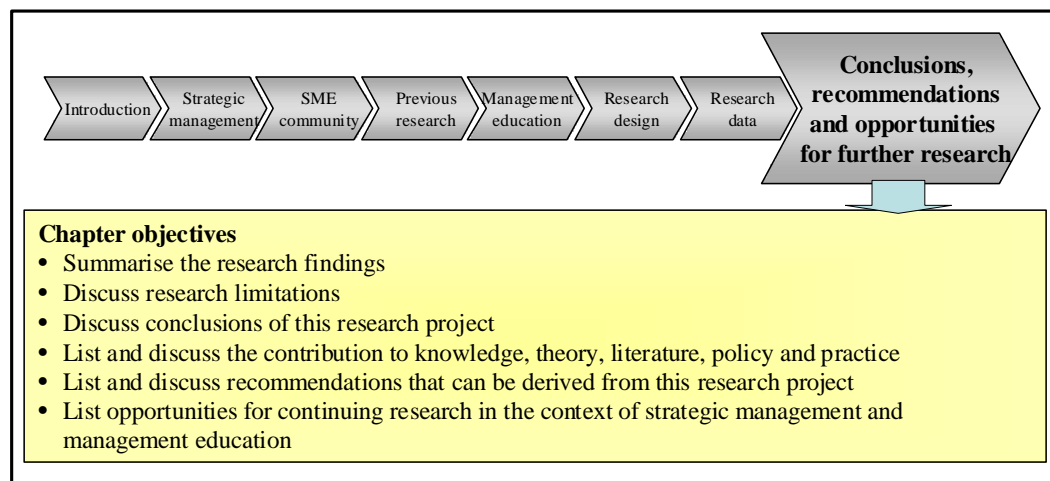


Figure 8.0: Objectives chapter 8

Source: Developed by researcher

The following introduction summarises the preceding chapters. In the course of the literature review, knowledge gaps were identified and questions arose.

Chapter 1 briefly introduced strategic management and strategic planning. Some criticise these tools (Mintzberg, 1994; Vasconcellos e Sá, 1989). The chapter goes on to introduce the SME community in Europe and Germany and describes the peculiarities of the German Mittelstand. In addition, existing empirical studies on strategic management in SMEs are introduced, followed by the introduction of the research sector machinery and equipment. The achievements and future challenges of this sector are briefly described. The chapter goes on to describe the researcher's motivation and the overall objectives of his research project as he is keen to understand the state of executives' education and their knowledge and skills regarding strategic management: how and where it was acquired and the impact on their management praxis and business.

Knowledge gaps identified:

- Relation of management education and type of education with SM (strategic management) practice and performance

Research questions arising:

- What is the state of executive knowledge regarding SM?
- Where do executives acquire SM knowledge?
- What is the impact of SM knowledge upon their management practice and the performance?
- Why do executives not apply SM?

Chapter 2 described the history and state of management and strategic management. Strategies and strategic management originated in the military area and were introduced to the business economics by management scientists in the 1950s (Cyril & Magee, 1953; Shubik, 1955; Payne, 1957; Ansoff, 1957). Today a wide variety of generic strategies, strategic management models and tools are available to executives and strategic management is regarded as an important instrument for managing an enterprise. Strategic planning is controversially discussed (Mintzberg, 1994a; Vasconcellos e Sá, 1989) but if executives consider the elements of strategic planning (O'Regan & Ghobadian, 2007) and derive action from it (Mankins & Steele, 2006), it is a valuable tool. The chapter continues with the introduction and brief description of a set of strategic management tools that reflect the phases of strategic management. These tools will be used in the field research to measure and quantify the penetration of strategic management in the research sector.

Research questions arising:

- What is the penetration of SM?
- What are motives and barriers to SM?
- What SM tools are known and applied by executives?

Chapter 3 provided comprehensive information regarding the community of small and medium-sized enterprises (SME) in Europe and Germany. SMEs play a vital role for the economy and society as they offer jobs to the majority of working people (European Commission, 2004; Guenterberg & Kayser, 2004). Politicians in the European Union and Germany have realised the importance of SMEs and have started initiatives to support SMEs and to facilitate their future success (European Commission, 2005c; Bundestag, 2001). The chapter goes on to introduce the manufacturing sector and, in particular, the machinery and equipment sector in Germany and discusses challenges this sector faces within the national and international environment and concludes with the discussion of the role of engineers in the machinery and equipment sector.

Research questions arising:

- Is lack of management education a reason for insolvencies (low ROS) in Germany?
- How do companies perceive challenges they are faced with?

- How do companies cope with challenges?
- How can management education help to cope with challenges ahead?
- What is the level of SM knowledge of engineers?

Chapter 4 introduced and discussed various empirical and statistical studies and papers regarding SME research in Germany on strategic thinking, strategic behaviour, strategic planning and strategy execution on the functional level as well as the top management level, published since the early 1980s. Most of the SME research cited concentrates on how and to what extent strategic thinking, management practices, strategic management and strategic planning are applied. Some research is related to what impact it has on business (Schmidt & Freund, 1989; Becker et al., 2006). Many SME leaders are not aware of the benefits of strategic planning or neglect it although they know about its benefits (Menke et al., 1996; KfW, 2004; Hechtfischer, 2004; Schluechtermann & Pointner, 2004). One of the great weaknesses of German SME managers is lack of strategic thinking and action as well as lack of management knowledge and strategic experience (Dembkowski, 2007). Research pertaining the education of business leaders regarding management practices, strategic management and strategic planning was, however, more or less neglected. Kayser (1987), Held et al. (2007) and Dembkowski (2007) touch on the issue of education. Held et al. (2007) researched the relation of management skills and education with the application of strategic management but did not research its impact on the outcome and performance of the enterprise. Researchers and social scientists propose continuing research in the area of strategic management in SMEs and educating SME leaders in strategic management (Held et al., 2007; Dembkowski, 2007).

Knowledge gaps identified (German SME and machinery and equipment sector):

- Level of SM education and knowledge
- Application SM knowledge
- Relation of SM education / knowledge with strategic practice
- Relation of SM practice with performance
- Motives to apply strategic planning process
- Status of SM practice
- Relation of SME size with SM knowledge

Research questions arising:

- What is the perception of executives of SM?
- What is the approach to SM?
- What are motives to apply strategic planning process?
- What SM tools are applied?
- What is the relation of SM practice with performance?

- What is the relation of SME company size with SM knowledge and SM practice in ME?

Chapter 5 defined management knowledge, described the history of management education, the education system in Germany and the postgraduate option for management education and pedagogical approaches. The chapter continues with the literature review regarding strategic management practice and management education and their relation with performance on an international scope. The higher education system in Germany is still in the transition period of compliance with the Bologna Accord signed by all Ministers of Education of the European Community in 1999 (BMWF, 2008b). Until then, higher education was split between a more praxis orientated and a more theoretically orientated system. The universities of applied science offer a more practical approach, the other universities a more theory study. In future, both types of universities can offer undergraduate (e.g. BS) and graduate studies (e.g. MS). Inquiries suggest that German universities lack general management or strategic management courses in their curricula (Ramirez, 2004). This applies even more to engineering faculties.

Knowledge gaps identified (international scope):

- Relation of specific selection of SM tools with performance
- Relation of types of education with SM management education, application and performance
- Relation of age and seniority with SM knowledge, strategic practice and performance (executive level)
- Relation of seniority with education
- Sources of SM education
- Continuing SM education
- Satisfaction with SM education
- Perception of SM

Research questions arising:

- What are the barriers and motives for application of SM in research sector?
- What SM knowledge have executives acquired and do apply?
- Where have executives acquired SM knowledge?
- What are executives doing to improve their SM knowledge?
- What is the relation of the type of education acquired with SM knowledge and application?
- What is the relation of education with performance?
- What is the relation of SM education with strategic practice?
- What is the relation of SM education with company performance?

- Are executive satisfied with SM education at universities?
- What improvements do executives want as regards SM education at university (content and pedagogy)?
- What is the impact of age and seniority upon SM knowledge and application as well as performance?

Chapter 6 defined specific research objectives and the final research questions which are listed in Table 8.1. The chapter goes on to describe the best suitable research process for this research sector and defines and explains the details of the field research.

1. What is the state of management education and, in particular, strategic management education of executives in the sector researched?
a) What strategic management knowledge was acquired in which area of education and via seminars or self-study?
b) What is the relation of the type of education with the acquisition of strategic management knowledge?
c) How do the responding executives rate the strategic management knowledge of their colleagues on the top executive level and the hierarchical level below?
d) Are the responding executives satisfied with the general and strategic management education during undergraduate or graduate studies? If not, why?
e) How much time do executives spend on continuing education regarding general and strategic management and which medium is used to acquire knowledge?
2. What is the current practice in strategic management in the sector researched?
a) What strategic management tools are applied in praxis?
b) What is the relation of the type of education with the application of strategic management knowledge?
c) What is the approach to strategic management in responding companies?
d) What are the motives and obstacles to strategic planning process?
e) What are the organisations and individuals doing to improve strategic management in their company?
f) What is the perception or understanding of the executives regarding strategic management?
g) What kind of challenges do the executives see ahead and how do they cope with them?
3. What is the relation of education and strategic management practice with the performance outcome?
a) What is the relation of education with the performance outcome?
b) What is the relation of continuing strategic management education with the performance outcome?
c) What is the relation of strategic management practice with the performance outcome?
4. What is the relation of the managers' age with strategic management knowledge, practice, and performance outcome?
a) What is the relation of the managers' age with strategic management knowledge and practice?
b) What is the relation of the managers' age with the performance outcomes of the company they lead?
5. What is the relation of the managers' seniority with strategic management knowledge, practice, performance outcome, and education?
a) What is the relation of the managers' seniority with strategic management knowledge and practice?
b) What is the relation of the managers' seniority with the performance outcomes of the company they lead?
c) What is the relation of the managers' seniority with their education?
6. What is the relation of the company size with strategic management knowledge and practice?
a) What is the relation of the company size with strategic management knowledge?
b) What is the relation of the company size with strategic management practice?

Table 8.1: Final research questions

Source: Developed by researcher

Chapter 7 described the data documentation. The core elements of this research are the various analyses and evaluation of numerous variables to address all research questions. The following section lists the research results in brief.

This chapter goes on to discuss conclusion, recommendation and further opportunities for research in topics relating to strategic management and education.

8.2 Answers to the research question and critical assumptions

The following sub-sections provide an abstract of the research results and findings discussed in detail in the previous chapter.

8.2.1 Answers to the research questions and conclusions

In the following, the research questions, sub-question and the entire research findings derived from the data evaluation are listed in short statements. This allows the reader to assess the results at a glance without reference to the previous chapter for pertinent information. In addition, short concluding comments are added.

Note: The numbers in parentheses refer to the relevant number of the finding.

Research question 1: What is the state of management education and, in particular, strategic management education of executives in the sector researched? (section 7.5)

What strategic management knowledge was acquired in which area of education and via seminars or self-study? (section 7.5.1)

1. More strategic management knowledge is acquired in seminars (17.2%) and via self-study (17.4%) than during graduate (16.5%) and postgraduate university study (5.5%).
2. The highest knowledge penetration is for quality management and the lowest for EFQM.
3. Average strategic management tool knowledge is 55.2% for top executives.

Concluding comments:

- There is evidence of lack of strategic management education at German universities (1); compare Ramirez (2004).
- One could argue that strategic management knowledge of top executives in German SMEs is low (3); compare Kayser (1987), Dembkowski, (2007), Held et al. (2007).

What is the relation of the type of education with the acquisition of strategic management knowledge? (section 7.5.2)

1. Significant relation between the strategic management tool knowledge rate and the type of education.
2. Significant differences stem from the under-representation of engineers in the acquisition of knowledge of certain strategic management tools.
3. Engineers in an executive position lack marketing knowledge.
4. Quality management and innovation management, typical engineer's domains, show high knowledge penetration for engineers.

5. Engineers acquire most of their strategic management knowledge in seminars or via self-study.

Concluding comments:

- There is strong evidence that engineers lack strategic management knowledge in general (1, 2, 3).
- There is strong evidence for lack of management education in German university engineering faculties (1, 2, 3, 5).

How do the responding executives rate the strategic management knowledge of their colleagues on the top executive level and the hierarchical level below? (section 7.5.3)

1. Respondents rate the strategic management knowledge of managers with an engineering education lower than that of managers with a business economics background.

Concluding comment:

- There is evidence that engineers lack strategic management knowledge (1).

Are the responding executives satisfied with the general and strategic management education during undergraduate or graduate studies? If not, why? (section 7.5.4)

1. Responding engineers are more dissatisfied with their university management education.
2. Business economists and business engineers are more satisfied.
3. Three MBAs are dissatisfied with their management education.
4. Engineers complain about the lack of university management education and suggest its inclusion in curricula.
5. Seven business economists and two MBAs criticise the lack of praxis orientation or lack of case study work in university management education.

Concluding comment:

- Engineers want management education at university level (1, 4).
- Business economists and MBA suggest more praxis orientation at university level (3, 5); compare Perren & Grant (2001); Boyatzis et al. (1996)

How much time do executives spend on continuing education regarding general and strategic management and which medium is used to acquire knowledge? (section 7.5.5)

1. The average number of training days spent in the last five years is 15.8 days.
2. Executive prefer self-study, but also use seminars and exchange of experience for continuing management training.
3. No relation between type of education and type of continuing training.

Concluding comment:

- There is slight evidence that engineers spent less time on continuing management training (1).

Research question 2: What is the current practice in strategic management in the sector researched? (section 7.6)

What strategic management tools are applied in praxis? (section 7.6.1)

1. On average, 36.6% of the strategic management tools are applied.; compare Held et al. (2007)
2. The highest application rate is for quality management and the lowest for EFQM.
3. Executives apply 66.6% of acquired strategic management knowledge.

Concluding comments:

- The application rate of about 36% is low, which relates to the lack of strategic management knowledge.
- There is evidence of lack of strategic management practice (1, 2); compare Dembkowski (2007)
- Knowledge absorption rate of 66.6%; compare Burgoyne et al. (2004, p. 1) *“Not all capability that exists at the individual level is fully used in collective organisational processes”*.

What is the relation of the type of education with the application of strategic management knowledge? (section 7.6.2)

1. Application of strategic management tools is related to the type of education.
2. Significant differences are the result of under-representation of engineers in the application of certain strategic management tools.
3. There is lack of application of marketing tools by engineers.
4. Quality management and innovation management, a typical engineer’s domains, show high application penetration for engineers.
5. The strategic management tool absorption rate is related to the type of education.
6. Engineers absorb a higher rate of strategic management tools (69.7%) compared to business economists (58.7%).
7. Companies led by engineers and not applying strategic planning (9.7%) are above average (8.2%).

Concluding comments:

- There is evidence that engineers lack strategic management application (2, 3)
- There is evidence that engineers are more inclined to apply management knowledge that was acquired (5).
- There is slight evidence that engineers seem to be less inclined to apply the strategic planning process (7).

What is the approach to strategic management in responding companies? (section 7.6.3)

1. Managing partners or managing directors are responsible for carrying out strategic management (86%). Management teams play a minor role.
2. Strategic planning process introduced on average, in 1998.
3. Over 92% of the responding companies claim to do strategic planning.
4. Some executives mix up operative planning with strategic planning.
5. Companies tend to execute their strategic plan with established procedures; the balanced scorecard plays a minor role.
6. Companies tend to keep information about the strategic plan or its important elements to the management level.

Concluding comments:

- More companies than expected claim to apply strategic management (3); compare Menke et al. (1996), KfW (2004), Schluechtermann & Pointner (2004), Hechtfischer (2004).
- However, there is evidence that the quality of the strategic planning process is questionable (4).

What are the motives and obstacles to strategic planning process? (section 7.6.4)

1. 86.2% of the executives apply strategic planning because they feel it is important for the future success of the company.
2. 16% of the companies are asked by their bank to prepare a strategic plan.
3. Time constraints (8.6%) and lack of knowledge (6.7%) are major barriers to strategic planning.
4. The strategic planning process is considered as too theoretical (6.7%) and too complex (3.7%).

Concluding comment:

- A large number of companies do strategic planning because the bank asks for it. This suggests that bankers borrowing money to companies are more convinced of strategic planning than the top executive of the respective company (2); compare Becker et al. (2004) who assumes that companies implemented management instruments under external pressure e.g. from bank regulations regarding loans.
- Barriers discovered are similar to those found in other research projects (3, 4); compare O'Regan & Ghobadian (2002, 2002a), Held et al. (2007), Wang et al. (2007)

What are the organisations and individuals doing to improve strategic management in their company? (section 7.6.5)

1. 81.0% of responding companies are taking steps to improve strategic management practice.

2. Seminars, workshops, or trainings (60.6%) as well as the exchange of experience (50.2%) are most important sources for improving strategic management.
3. 19.7% of companies engage external consultants for the improvement of strategic management.

Concluding comments:

- There is evidence that most companies see a need for the improvement of their strategic management practice (1, 2).
- The high rate of consultant engagement suggests the assumption that executives rate the strategic management expertise of external consultants higher than their own.

What is the perception or understanding of the executives regarding strategic management? (section 7.6.6)

1. 72.5% of the respondents provided a statement on their perception of strategic management.
2. Three managing partners (two engineers, one business engineer) stated that they do not know what strategic management is.
3. Three managing partners (two engineers, one industrial clerk) do not see the necessity for strategic management.
4. Some executives mix up operative planning with strategic planning (see also 7.6.3).
5. Most counted elements are strategic behaviour, objectives and strategy execution.
6. Key elements such as scenario technique, internationalisation, ecology, market segmentation, price mix, or strategic controlling, governance and early warning are hardly mentioned.

Concluding comments:

- There is slight evidence that engineers lack understanding and practice of strategic management (2, 3).
- There is evidence that the quality of the strategic planning process is questionable (4).
- Findings suggest that executives neglect strategic controlling, governance and early warning (5, 6)

What kind of challenges do the executives see ahead and how do they cope with them? (section 7.6.7)

1. Most companies see the challenges in the external environment.
2. Many companies were surprised by the economic crisis.
3. Most measures taken are in the areas of personnel recruitment (37) despite signs of the forthcoming economic crisis.

Concluding comment:

- There is evidence of a lack of consequent environmental observation and strategic controlling (2, 3). See also above section 7.6.6, lack of strategic controlling, governance and early warning; compare BDU (2005)

Research question 3: What is the relation of education and strategic management practice with the performance outcome? (section 7.7)

What is the relation of education with the performance outcome? (section 7.7.1)

1. Business engineers generate on average the highest turnover per employee, followed by engineers.
2. MBAs generate on average the highest return on sales while engineers generate the lowest rate.
3. Companies led by business economists have the highest average equity ratio, companies led by MBAs have the lowest rate.
4. Companies led by MBAs have the highest average R&D ratio, followed by companies managed by engineers.
5. Companies managed by MBAs have the highest average continuous improvement rate, followed by companies led by engineers and business engineers.
6. However, there is no significant statistical difference between the means of the groups for all evaluations above.

Concluding comments:

- The findings suggest that business engineers tend to focus on efficiency in comparison with those of another educational background (1).
- The findings suggest that MBAs tend to focus on bottom line profit while engineers may not (2)
- The findings suggest that business economists tend to focus on the balance sheet while MBAs may not (3).
- The findings suggest that MBAs and engineers tend to focus on innovation (4).
- The findings suggest that MBAs tend to better promote employee suggestions (5).
- Compare in this context also Baruch & Peiperl (2000), Leonhardt (2000), Analoui & Hosseini (2001), Pfeffer & Fong (2002)

What is the relation of continuing strategic management education with performance outcome? (section 7.7.2)

1. No significant relation between continuing management training and performance parameters.

Concluding comment:

- Although one could argue that continuing management training has a positive impact on the company performance, no relation could be found for the respective

variables in this research project (1); compare Fulmer & Graham (1993), Lee et al. (1993), Winterton & Winterton (1996), Pfeffer (1998), Purcell et al. (2003)

What is the relation of strategic management practice with the performance outcome?
(section 7.7.3)

1. There is a significant relation between the strategic management tool application rate and the R&D ratio.
2. There is a relation between the strategic management tool application rate and turnover per employee.
3. There is a significant relation between the year strategic planning was introduced and return on sales.
4. There is a relation of the year strategic planning was introduced with the equity ratio.
5. There is a significant relation between some individual strategic management tools and performance measures.
6. There is no significant relation between the type of strategic planning process and performance measures.
7. There is no significant relation between realisation of strategic planning and performance measures.
8. There is no significant relation between barriers to strategic planning and performance measures.
9. There is a significant relation of some elements between motivation for strategic planning and performance measures.
10. There is a significant relation between some elements of the communication of strategic plans and performance measures.
11. There is a significant relation between some elements of the execution of strategic plans and performance measures.

Concluding comments:

- The findings suggest that executives with a higher strategic management tool application rate put more emphasis on R&D (1) and generate a higher turnover per employee (2); compare Cockerill (1993)
- There is evidence that companies generate more profit (3) or may have generated or maintained a high equity ratio (4) if they introduced strategic planning at an early stage.
- The findings suggest that some individual strategic management tools (e.g. SWOT, overhead value analysis) have a positive impact on performance (5).
- The findings suggest that some elements of motivation for strategic planning have an impact on performance (9). e.g. companies having a strategic planning process

in place because the parent company requires it, have a higher average turnover per employee.

- The findings suggest that some elements of the communication of strategic plans have an impact on performance (10). e.g. companies who communicate the strategic plan or elements of it to all employees, achieve a higher average turnover per employee.
- The findings suggest that some elements of the execution of strategic plans have a positive impact on performance (11). e.g. companies who use the balanced scorecard have an average continuous improvement rate that is twice as high as that of other companies.
- In summary, the findings suggest a positive impact of elements of strategic management practice on company's performance parameters (1-11); compare Schmidt & Freund (1989), Griggs (2002), Becker et al. (2006), Cheese et al. (2007)

Research question 4: What is the relation of the managers' age with strategic management knowledge, practice and performance outcome? (section 7.8)

What is the relation of the managers' age with strategic management knowledge and practice? (section 7.8.1)

1. Older executives have less knowledge of strategic management.
2. Strategic management tool absorption rate increases with the age of the respondent.

Concluding comments:

- The findings suggest that older executives had little or no management education or have failed to keep their management knowledge up to date (1).
- The findings suggest that older executives are more inclined to apply management knowledge they once acquired (2).

What is the relation of the managers' age with the performance outcomes of the company they lead? (section 7.8.2)

1. Companies managed by older executives have a lower rate of continuous improvement.
2. Otherwise, no significant relation of age with performance.

Concluding comments:

- The findings suggest that older executives are less inclined to employ management tools such as the continued improvement process (1).

Research question 5: What is the relation of the managers' seniority with strategic management knowledge, practice, performance outcome and education? (section 7.9)

What is the relation of the managers' seniority with strategic management knowledge and practice? (section 7.9.1)

1. Executives who have held their current position for only a few years have more knowledge of strategic management.
2. Executives who have held their current position for only a few years have a lower strategic management tool absorption rate.
3. These findings correlate the relation between age and knowledge of strategic management tools and its absorption rate.

Concluding comments:

- The findings suggest that executives who are longer in their current position had little or no management education or failed to keep their management knowledge up to date (1).
- The findings suggest that executives with longer seniority are more inclined to apply management knowledge once acquired (2).

What is the relation of the managers' seniority with the performance outcomes of the company they lead? (section 7.9.2)

1. There is a significant relation between the executive's seniority and return on sales.
2. There is a significant relation between the executive's seniority and the equity ratio.
3. There is a significant relation between the executive's seniority and the R&D ratio.

Concluding comments:

- The findings suggest that executives longer in their current position generate a higher return on sales (1); compare Goleman (1998) who argues that emotional intelligence increases with age, maturity
- The findings suggest that executives longer in their current position generate a higher equity ratio (2).
- The findings suggest that executives longer in their current position pay more attention to innovation (3).

What is the relation of the managers' seniority with their education? (section 7.9.3)

1. Seniority is related to and dependent upon the type of education.

Concluding comments:

- The findings suggest that executives with technical education in area A (professional, master, technician) stay longest in their position followed by engineers (1).

Research question 6: What is the relation of the company size with strategic management knowledge and practice? (section 7.10)

What is the relation of the company size with strategic management knowledge? (section 7.10.1)

1. There is a significant relation between strategic management knowledge and the size of the company.

Concluding comments:

- Findings suggest that larger SMEs care more about strategic management knowledge (1); compare Geiser (1983).

What is the relation of the company size with strategic management practice? (section 7.10.2)

1. There is a significant relation between company size and strategic management tool application rate.
2. There is a significant relation between company size and strategic management tool absorption rate.
3. There is a significant relation between company size and application of the strategic planning process
4. There is no significant relation between company size and other dependent variables, such as the strategic planning process, barriers against it or motives for it, the communication and execution of the strategic plan and improvement of strategic management.

Concluding comments:

- The findings suggest that larger SMEs are, on average, more involved in strategic management (1, 2, 3); compare Geiser (1983).

Further research results derived from the survey (section 7.11)

Relation of company size with company performance

1. There is a significant positive relation between the company size and turnover per employee.
2. There is a significant negative relation between the company size and continuous improvement rate.

Concluding comments:

- The findings suggest that larger SMEs generate a higher turnover per employee and are more efficient (1).
- The findings suggest that smaller SMEs are more successful in motivating employees to make suggestions (2).

Relation of R&D ratio with other company performance indicators

1. There is a significant relation between the R&D ratio and return on sales.
2. There is a significant relation between the R&D ratio and continuous improvement rate.

Concluding comments:

- The findings suggest that companies investing more in R&D generate more profit (1).
- The findings suggest that companies spending more on R&D are more inclined to use the benefits of employee suggestions (2).

The final research questions were addressed in the field research and in the course of the data analysis and evaluation.

Figure 8.1 depicts a summary of the findings in a map, indicating the relations between key variables.

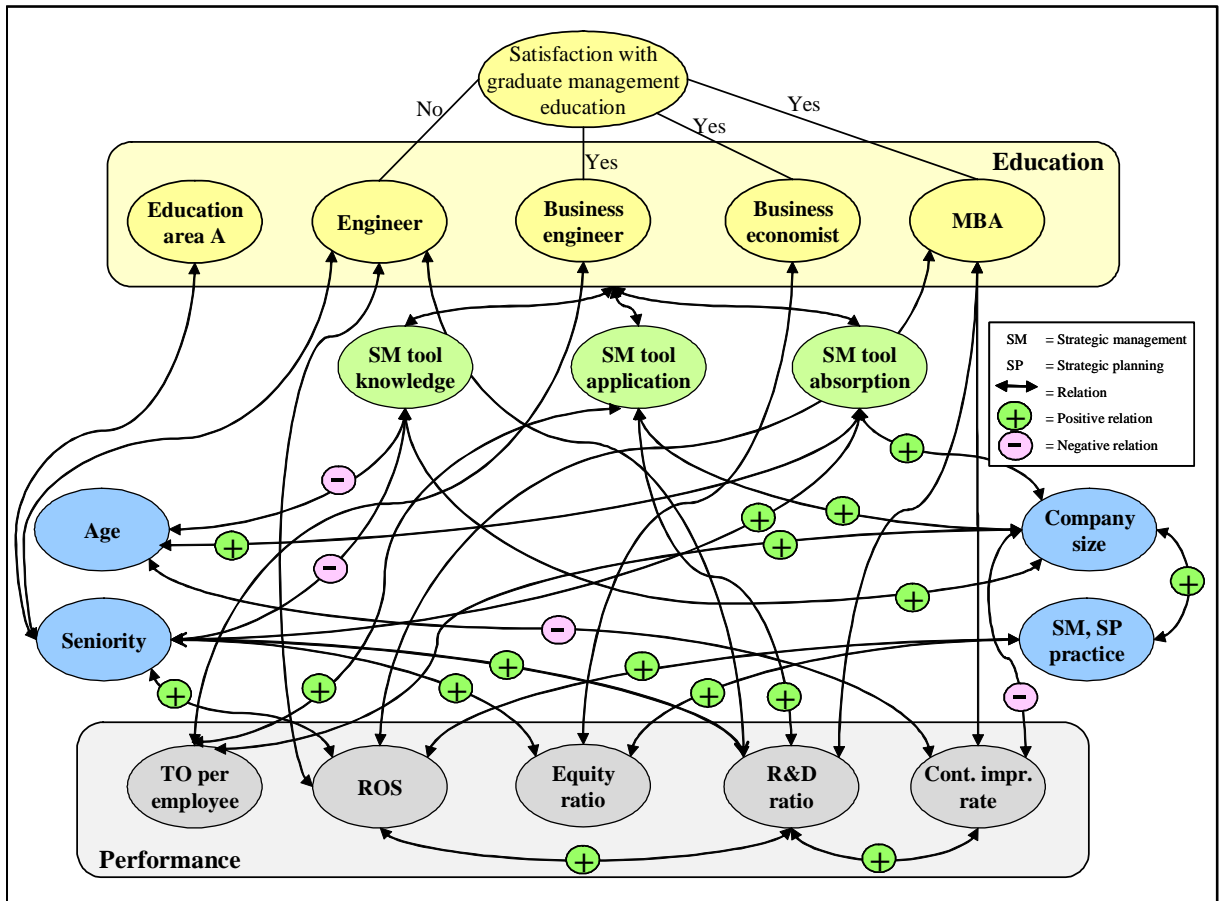


Figure 8.1: Relation map of findings

Source: Developed by researcher

8.2.2 The response to the critical assumption

The researcher identified a research problem and defined the following critical assumption: *“Lack of strategic management education leads to the neglect or misuse of the strategic management processes and tools and may induce underperformance of the business.”*

The outcome of the research project strongly proves this assumption. Respondent executives acquired more knowledge of strategic management by attending seminars or by studying independently than during their university education. They have knowledge of about half the tools of strategic management and apply only a third of those tools required.

This indicates the lack of management education at German universities in general. Engineers are far below the mean of strategic management knowledge and application rate. This is caused by the lack of management education in engineering universities or engineering faculties. Although most of the respondent executives claim to carry out strategic planning, there is evidence suggesting to question the quality of this process in the research sector. There is also evidence of the positive impact of strategic management education and application with performance measures of respondent companies

8.2.3 Questions and issues raised in the course of the evaluations

In the course of the evaluation process of this research project, questions and issues arose. They are summarised in the following list (Table 8.2) and will be further pursued in the sections recommendations and opportunities for further research.

Questions and issues raised in the course of the evaluations	Section	Addressed in
How does this knowledge profile compare to the knowledge situation in other industry sectors?	7.5.1	Opportunities for future research
Why do engineering faculties of German universities offer little or no management education for engineers?	7.5.2	Recommendations
Should improvements of management education at German universities (curricula and pedagogy) be suggested?	7.5.4	Recommendations
Are there obstacles to include management education at engineering faculties?	7.5.4	Recommendations
How does continuing management training compare with other industry sectors?	7.5.5	Opportunities for future research
Why do executives not apply more of their acquired management knowledge?	7.6.1	Opportunities for future research
How does this knowledge application profile compare to other industry sectors?	7.6.1	Opportunities for future research
What is the strategic management situation in other German industry sectors?	7.6.3	Opportunities for future research
What is the quality level of the strategic planning process in German SMEs?	7.6.3	Opportunities for future research
Should the barriers to SM be considered by academics developing and communicating strategic management tools?	7.6.4	Recommendations
How can strategic management and, in particular, the strategic planning process and the pertinent tools be made less complex and more attractive and user friendly for SME executives?	7.6.4	Recommendations
Should the issue of “gut feeling” versus structured strategic management be examined more closely?	7.6.6	Opportunities for future research
Would one recommend that the the relation of seniority with company performance should be further explored?	7.9.2	Opportunities for future research

Table 8.2: Questions and issues raised in the course of the evaluations

Source: Developed by researcher

8.2.4 Research limitations

Chapter 6 has dealt with limitations of the research methodology selected e.g. general limitations such as the interpretation of performance indicators. The question is now, how valuable and meaningful the research findings are with respect to the entire research sector. The research findings are based upon the evaluation of 269 responses. This represents 4.51% of the total population of 5.958 companies. One could always argue that the findings for about 5% of a population are not necessarily representative for the entire population. However, there are sound arguments supporting the assumption that the

findings of this research are representative for the entire population. One argument is the fact that the entire research sector was covered with survey questionnaires. Every company has received a survey questionnaire. However the main arguments are the results from the non-response bias calculation in chapter 7. No significant bias was discovered for several variables.

8.3 The contribution of this research project to knowledge and theory

At the end of a research project, there is always the question about its outcome and what can be learned from it. Some briefly ask: “So what?” The following sections will give an answer to this question and show the researcher’s contribution to the body of knowledge and theory.

Table 8.3 lists the knowledge gaps that were identified in the literature review in the preceding chapters. The knowledge gaps were clustered and sorted. In addition the scope and relevance as well as the respecting sections of the data analysis and evaluation were added.

Knowledge gaps identified	Scope relevance	Discoverd in chapter	Analysed in section
SM education and knowledge of executives; sources	G	4, 5	7.5.1
Relation of education with SM knowlege	G	5	7.5.2
Satisfaction with SM education	G	5	7.5.4
Continuing SM education	G	5	7.5.5
SM application by executives	G	4	7.6.1
Relation of education with SM practice	G	4	7.6.2
Status of SM practice	G	4	7.6.3
Relation of education with performance in German SMEs	G, I	1, 4, 5	7.7.1
Relation of SM practice with performance	G, I	4	7.7.3
Motives to apply strategic planning process	G, I	4, 5	7.6.4
Relation of age and seniority with SM knowledge, strate gic practice & performance	G, I	5	7.8.1/2 7.9.1/2
Relation of seniority with education	G, I	5	7.9.3
Relation of SME size with SM knowledge	G, I	4	7.10.1

Strategic management; G = Germany and machinery & equipment sector; I = International

Table 8.3: Summary of knowledge gaps

Source: Developed by researcher

Table 8.4 lists the research questions asnd the first conclusion as well as the links to previous research results and papers. The column on the right lists the contribution of this research project to knowledge and theory which is rated by the researcher as follows:

- X adding new aspects to existing knowledge
- XX complementing existing knowledge
- XXX creating new knowledge

Research question	Analysed in section	Brief summary of key findings; first conclusions	Compare with previous research results & papers:	Contribution
1. What is the state of management education and, in particular, strategic management education of executives in the sector researched?	7.5			---
a) What strategic management knowledge was acquired in which area of education and via seminars or self-study?	7.5.1	* Most acquired in seminars, self-study > universities neglect * Knowledge rate 55.2%	Kayser 1987; Dembkowski 2007; Held et al. 2007	XX
b) What is the relation of the type of education with the acquisition of strategic management knowledge?	7.5.2	* Knowledge related to type of education * Engineers > low knowledge > engineering faculties neglect		XXX
c) How do the responding executives rate the strategic management knowledge of their colleagues on the top executive level and the hierarchical level below?	7.5.3	* Engineers' knowledge rated low * Engineers > low knowledge > engineering faculties neglect		
d) Are the responding executives satisfied with the general and strategic management education during undergraduate or graduate studies? If not, why?	7.5.4	* Engineers most dissatisfied * Engineer complain about lack of management education * Business economists, MBAs criticise lack of praxis orientation	Batley 1987	XX
e) How much time do executives spend on continuing education regarding general and strategic management and which medium is used to acquire knowledge?	7.5.5	* Average number of training days spent in last 5 years is 15.8 * Slight evidence that engineers spent less * Executives prefer self-study		XXX
2. What is the current practice in strategic management in the sector researched?	7.6			---
a) What strategic management tools are applied in praxis?	7.6.1	* Application 36.6% * Absorption rate 66.6%	Burgoyne et al. 2004; Dembkowski 2007; Held et al. 2007	XX
b) What is the relation of the type of education with the application of strategic management knowledge?	7.6.2	* Application is related to the type of education * Engineers' application low but absorption high		XXX
c) What is the approach to strategic management in responding companies?	7.6.3	* In average introduced in 1998 * 92% of responding companies claim to do strategic planning * Questions about quality of strategic planning process	Albach 1983; Albach et al. 1985; Kayser 1987; Geschka 1990; Hamer 1990; Horáth & Weber 1990; Pföhl 1990; Wosidlo 1990; Kriegbaum 1995a; Zechlin 1995; Menke et al. 1996; Schaefer et al. 2001; BDI 2003; Waldmann & Wagner 2003; Becker et al. 2004; Hechttscher 2004; KfW 2004; Schluechtemann & Pointner 2004; BDU 2005; Dembkowski 2007; Euler Hermes 2007; Heidenreich & Wimmers 2007; Held et al. 2007	X
d) What are the motives and obstacles to strategic planning process?	7.6.4	* 16% of companies are asked by bank to prepare a strategic plan * Strategic planning process considered too theoretical / complex	O'Regan & Ghobadian 2002a; Held et al. 2007; Wang et al. 2007	XX
e) What are the organisations and individuals doing to improve strategic management in their company?	7.6.5	* Seminars, workshops, or trainings rated highest * 20% of companies engage consultant		XXX
f) What is the perception or understanding of the executives regarding strategic management?	7.6.6	* Strategic controlling, early warning hardly mentioned * Some executive mix up operative planning with SP	Compare also research results and papers cited above regarding research question 2c (What is the approach to SM....?)	X
g) What kind of challenges do the executives see ahead and how do they cope with them?	7.6.7	* Many companies surprised by the economic crisis * Most measures taken in the areas of personnel recruitment * Evidence of a lack of consequent environmental observation		
3. What is the relation of education and strategic management practice with the performance outcome?	7.7			
a) What is the relation of education with the performance outcome?	7.7.1	* Business engineers tend to focus on efficiency * MBAs tend to focus on bottom line profit * MBAs and engineers tend to focus on innovation	Baruch & Peiperl 2000; Leonhardt 2000; Analoui & Hosseini 2001; Pfeiffer & Fong 2002	XX
b) What is the relation of continuing strategic management education with the performance outcome?	7.7.2	* No significant relation of continuing management education with performance	Fulmer & Graham 1993; Lee et al. 1993; Winterton & Winterton 1996; Pfeiffer 1998; Purcell et al. 2003	X
c) What is the relation of strategic management practice with the performance outcome?	7.7.3	* Evidence: more innovation if SM tool application rate high * Evidence: more profit if strategic planning introduced early * Significant relation of some SM tools with performance	Schmidt & Freund 1989; Fox & McLeay 1991; Cockerill 1993; Griggs 2002; BDU 2005; Becker et al. 2006; Cheese et al. 2007	XX
4. What is the relation of the managers' age with strategic management knowledge, practice, and performance outcome?	7.8			---
a) What is the relation of the managers' age with strategic management knowledge and practice?	7.8.1	* Knowledge of SM tools declines with the age * SM tool absorption rate increases with the age		XXX
b) What is the relation of the managers' age with the performance outcomes of the company they lead?	7.8.2	* Continuous improvement rate declines with the age * Otherwise no significant relation of age with performance	Waldman & Avolio 1986; McEvoy & Cascio 1989; Ng & Feldman 2008	XX
5. What is the relation of the managers' seniority with strategic management knowledge, practice, performance outcome, and education?	7.9			---
a) What is the relation of the managers' seniority with strategic management knowledge and practice?	7.9.1	* Knowledge of SM tools declines with the seniority * SM tool absorption rate increases with the seniority		XXX
b) What is the relation of the managers' seniority with the performance outcomes of the company they lead?	7.9.2	* Evidence: executives longer in current position higher ROS * Evidence: executives longer in current position higher equity ratio * Evidence: executives longer in current position more innovation		XXX
c) What is the relation of the managers' seniority with their education?	7.9.3	* Seniority is related to type of education * Engineers stay long in their position		XXX
6. What is the relation of the company size with strategic management knowledge and practice?	7.10			---
a) What is the relation of the company size with strategic management knowledge?	7.10.1	* Evidence: increase of SM knowledge with the size of the company		XXX
b) What is the relation of the company size with strategic management practice?	7.10.2	* SM tool application increases with the size of the company * SM tool absorption increases with the size of the company	Geiser 1983	X

ROS = Return on sales; SM = Strategic management; SP = Strategic planning

Table 8.4: Key findings with links to research questions and previous research
Source: Developed by researcher

The following sub-sections address the contribution to knowledge and theory in the context of strategic management education and knowledge of executives in German SMEs and, in particular, the machinery and equipment sector.

8.3.1 Strategic management education and knowledge of executives

Quantitative analysis of the strategic management knowledge of German executives was, as yet, not extensive. Kayser (1987), Dembkowski (2001) and Held et al., (2007) touch upon this issue (chapter 4) but do not provide a measure of strategic management knowledge.

The outcome from research question 1a (What strategic management knowledge was acquired in which area of education and via seminars or self-study? Section 7.5.1) complements existing knowledge and theory by providing the following:

- Quantitative analysis of knowledge regarding 31 selected representative management tools along the phases of strategic management
- Information about the management knowledge profile of top executives
- Information about the sources of management knowledge
- Evidence that German universities lack strategic management education

8.3.2 Relation of education with strategic management knowledge

Previous research results regarding the relation of education with strategic management knowledge in Germany could not be found.

The output from research questions 1b and 1c (What is the relation of the type of education with the acquisition of strategic management knowledge? How do the responding executives rate the strategic management knowledge of their colleagues on the top executive level and the hierarchical level below? Section 7.5.2 and 7.5.3) has created new knowledge and theory by providing the following:

- Evidence of a significant relation of the type of education with strategic management knowledge
- Evidence that engineers lack strategic management knowledge
- Evidence that German engineering faculties neglect strategic management education

8.3.3 Satisfaction of the executives with their management education

Having surveyed training needs, Batley (1987), New Zealand, discovered that engineers want more management education. Research papers regarding the satisfaction of management education in Germany could not be found.

The outcome from research question 1d (Are the responding executives satisfied with the

general and strategic management education during undergraduate or graduate studies? If not, why? Section 7.5.4) complements existing knowledge and theory by providing the following:

- Evidence that engineers are dissatisfied with their university management education; they suggest inclusion in curricula
- Evidence that lack of case study work and praxis orientation are an issue in university management education

8.3.4 Continuing strategic management education

The issue of continuing strategic management education of German executives was not part of any research introduced in chapters 4 and 5.

The output from research question 1e (How much time do executives spend on continuing education regarding general and strategic management and which medium is used to acquire knowledge? Section 7.5.5) has created new knowledge and theory by providing the following:

- Quantitative measure of continuing strategic management education within the last five years
- Evidence that executives prefer self-study
- Slight evidence that engineers spent less time on continuing management education

8.3.5 Strategic management application by executives

A quantitative analysis of strategic management application of German executives has been so far neglected. Held et al. (2007) and Dembkowski (2007) touch upon this issue. Burgoyne et al. (2004) address the issue of knowledge absorption.

The findings from research question 2a (What strategic management tools are applied in praxis? Section 7.6.1) complement existing knowledge and theory by providing the following:

- Strategic management application profile of executives on the basis of 31 selected representative management tools along the phases of strategic management
- Quantitative measure of the strategic management absorption rate
- Evidence of lack of strategic management practice

8.3.6 Relation of education with strategic management practice

The relation of the type of education with strategic management application of German executives was not part of any research introduced in chapters 4 and 5.

The results from research question 2b (What is the relation of the type of education with the application of strategic management knowledge? Section 7.6.2) has created new

knowledge and theory by providing the following:

- Evidence of a significant relation of the type of education with the application of strategic management tools
- Evidence that engineers lack strategic management application
- Evidence that the knowledge absorption rate of engineers is higher
- Evidence that engineers are less inclined to apply strategic planning

8.3.7 The approach to strategic management

Chapter 4 has discussed the state of strategic management in German SMEs on the basis of various empirical and statistical studies and papers published since the early 1980s (see references in Figure 8.4)

The output from research questions 2c and 2g (What is the approach to strategic management in responding companies? What kind of challenges do the executives see ahead and how do they cope with them? Section 7.6.3 and 7.6.7) has added new aspects to existing knowledge and theory by providing information about the following:

- Year in which strategic planning was introduced
- Penetration of strategic planning in the research sector
- Type of strategic planning process applied
- Execution process of strategic plans
- Communication practice of strategic planning elements
- Evidence of lack of environmental observation and strategic controlling

8.3.8 Motives and obstacles to strategic planning

Barriers to strategic planning have been subject to research (O'Regan & Ghobadian, 2002; 2002a; Held et al., 2007; Wang et al., 2007), but there is little on motives for strategic planning.

The output from research question 2d (What are the motives and obstacles to strategic planning process? Section 7.6.4) complements existing knowledge and theory by providing the following:

- Ranking of motives for application of strategic management
- Evidence that the bank requires a strategic plan from 16% of the responding companies.
- Evidence that executives consider strategic planning as too theoretical and complex

8.3.9 Improvement of strategic management

The issue of the improvement of strategic management in SMEs was not part of any

research introduced in chapters 4.

The findings from research question 2e (What are the organisations and individuals doing to improve strategic management in their company? Section 7.6.5) create new knowledge and theory by providing the following:

- Evidence that most companies see a need for the improvement of strategic management practice
- Evidence of a high rate of external consultant engagement.

8.3.10 The perception of strategic management

The research results and papers discussed in chapter 4 have characterised the thinking and behaviour of SME leaders regarding strategic management.

The output from research question 2f (What is the perception or understanding of the executives regarding strategic management? Section 7.6.6) provides new aspects to existing knowledge and theory by providing the following:

- Slight evidence that engineers lack understanding and practice of strategic management
- Evidence that the quality of the strategic planning process is questionable
- Evidence that key elements of strategic management are neglected

8.3.11 Relation of education with performance

In the German literature, research results regarding the relation of the type of education or management education with company performance outcome could not be found. As discovered from the findings of research questions 1b and 2b (What is the relation of the type of education with the acquisition of strategic management knowledge? What is the relation of the type of education with the application of strategic management knowledge? Section 7.5.2 and 7.6.2) the degree of management education and its application is related to the type of education (see section 8.3.2 and 8.3.6).

On an international scale, Baruch & Peiperl (2000), Leonhardt (2000), Analoui & Hosseini (2001), Pfeffer & Fong (2002) provided knowledge on the relation of an MBA education with performance.

The results from research question 3a (What is the relation of education with the performance outcome?) complement existing knowledge and theory by providing the following:

- Slight evidence that types of education tends to focus on certain performance parameters

8.3.12 Relation of continuing management education with performance

Only in the international literature were research results found on the relation of continuing management education and performance (Fulmer & Graham, 1993; Lee et al., 1993; Winterton & Winterton, 1996; Pfeffer, 1998; Purcell et al., 2003) have published results regarding continuing management training,

The findings from research question 3b (What is the relation of continuing strategic management education with the performance outcome? Section 7.7.2) provide new aspects to existing knowledge and theory by providing the following:

- No evidence of a significant relation of continuing strategic management and performance parameter

8.3.13 Relation of strategic management practice with performance

Numerous researchers (Schmidt & Freund, 1989; Fox & McLeay, 1991; Cockerill, 1993; Griggs, 2002; BDU, 2005; Becker et al., 2006; Cheese et al., 2007) published on the subject of the relation of strategic management education and practice with performance.

The outcome from research question 3c (What is the relation of strategic management practice with the performance outcome? Section 7.7.3) complements existing knowledge and theory by providing the following:

- Evidence that the strategic management tool application rate is positively related to company performance parameters
- Evidence that companies generate more profit and have a higher equity ratio if they introduced strategic planning at an earlier stage
- Evidence of positive relation of elements of strategic planning and certain management tools with performance

8.3.14 Relation of age and seniority with strategic management knowledge, strategic practice and performance

To date, the relation of the age and seniority with strategic management knowledge, strategic practice and performance has been neglected in German management research. Waldman & Avolio (1986), McEvoy & Cascio (1989), Ng & Feldman (2008) have analysed and published research results on the relation of age with performance.

The findings from research questions 4a / 5a and 4b / 5b (What is the relation of the managers' age / seniority with strategic management knowledge and practice? What is the relation of the managers' age / seniority with the performance outcomes of the company they lead? Section 7.8 and 7.9) complement or generate new knowledge and theory by providing the following:

- Evidence of a significant relation of age and seniority with strategic management knowledge and its absorption rate

- Evidence of a significant relation of seniority with key performance indicators

8.3.15 Relation of seniority with education

The literature review did not reveal any research results regarding the relation of seniority with the type of education.

The outcome from research question 5c (What is the relation of the managers' seniority with their education? Section 7.9.3) creates new knowledge and theory by providing the following:

- Evidence that the seniority of executives is related to the type of education.

8.3.16 Relation of SME size with strategic management knowledge and practice

Through an empirical research, Geiser (1983) came to the conclusion that larger SMEs employ better management practices than smaller ones.

The findings from research questions 6a / 6b (What is the relation of the company size with strategic management knowledge / practice? Section 7.10) complement existing knowledge and theory by providing the following:

- Evidence that company size is related to strategic management knowledge, its application and absorption.

8.3.17 Overall contribution to knowledge and theory

Research in the context of management education, strategic management practice and its impact on performance were neglected in the research sector machinery and equipment in Germany (see Figure 4.1 in section 4.8). This research project contributes to knowledge and theory by providing a comprehensive description of the state of strategic management education of executives in German SMEs and the state of strategic management in the research sector.

The following section will discuss ways on how this knowledge will be distributed.

8.4 Contribution to literature

The researcher contributes to the literature by focusing on the following topics and conclusions of this research project:

1. Status of management knowledge of executives in Germany and the level of knowledge in relation to and in the context of type of education and source of knowledge
2. The impact of management education upon the praxis of strategic management and company performance
3. Management education of engineers; what stakeholders should do

The contribution to various kinds of literature was and will be carried out or proposed with the following publications and measures:

1. Guideline “Ganzheitliche strategische Unternehmensfuehrung und Management-Werkzeuge” (integrated strategic management and management tools); sent to respondents in April 2009 (Wagner, 2009)
2. Research summary; sent to participants, supporting institutions, associations and universities in December 2009 (Wagner, 2009a)
3. Publication of this thesis as a book as soon as it is finally approved; possible publishers have been contacted
4. The submission of the thesis to engineering faculties of German universities as well as Deutsche Gesellschaft fuer Qualitaet (DGQ, German Society for Quality), Verein Deutscher Ingenieure (VDI, Association of German Engineers), Verband Deutscher Maschinen- und Anlagenbau e.V. (VDMA, Association of German Machinery and Equipment Manufacturers)
5. Proposal of papers to international journals and business magazines as follows:
 - a. State of strategic management knowledge and application: the case of the German machinery and equipment sector (Strategic Management Journal)
 - b. Engineering education: the performance imperative linking performance to education (International Journal of Operations & Production Management)
 - c. Management education impacts performance: the case of the German machinery and equipment sector (European Management Journal)
 - d. Managing a sustainable machinery and equipment industry: policy guidance what should the stakeholders do? (International Journal of Information Technology)
6. Proposal of series of articles in German language magazines and periodicals: VDI Nachrichten (VDI News) ;QZ Qualitaet und Zuverlaessigkeit (Quality and Reliability); IO New Management; VDMA newsletter

Figure 8.2 illustrates the bridge from theory to praxis. Through research projects, management scientists create new knowledge and construct theories which are published in books, papers or journal articles or which are given in presentations. The aim is not only to distribute knowledge, but also to address policy makers, who may be politicians or members of educational bodies or diverse associations, who have the power, influence and instruments to promote and transfer new knowledge to praxis by adapting or changing current policies, regulations, processes and practices.

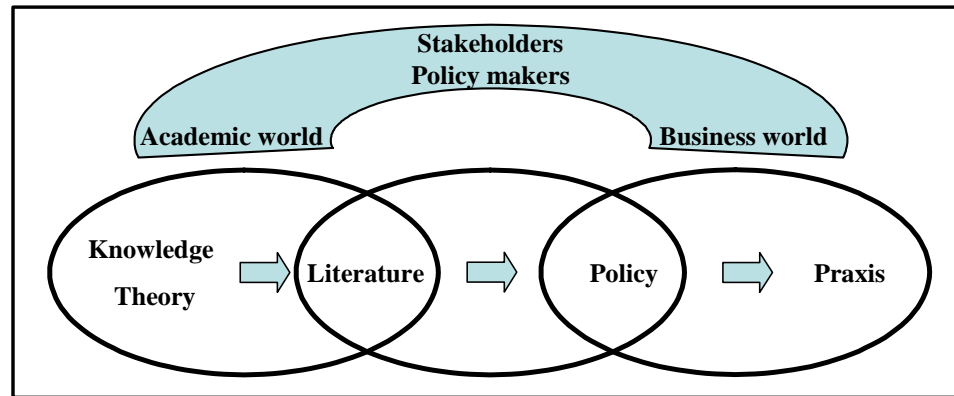


Figure 8.2: The bridge from theory to praxis

Source: Developed by researcher

The following section provides specific recommendations to stakeholders and policy makers derived from this research project.

8.5 Recommendations; contribution to policy and praxis

The researcher is particularly keen to make recommendations to stakeholders and policy makers of management education and the machinery and equipment sector in Germany. The findings and conclusions of this research project provide starting points for several recommendations.

8.5.1 Strategic management and the curricula of engineering faculties

In February 2009, the researcher had a discussion with the Dean of the Engineering Faculty of a German university. When asked whether strategic management education was necessary for engineers, he dissented. He recommended it for business engineers, but not for engineers. After it was mentioned that over 40 % of the top executives and owners of SMEs in the machinery and equipment sector are engineers, he was surprised. This is very probably the answer to the question that came up in the course of the data analysis and evaluation. Why do engineering faculties of German universities offer little or no management education for engineers? The need for management education is neglected.

The researcher also looked into possible obstacles which could prevent the inclusion of strategic management in the engineering curricula. German universities are free to design the curricula (BMJ, 2007; BSJ, 2009; BSJ, 2001). Some regulations for the curricula are provided in the federal “Hochschulrahmengesetz” (Framework act for higher education) and on the state level e.g. the “Bayrisches Hochschulgesetz” (Bavarian act for higher education) and the Rahmenprüfungsordnung fuer die Fachhochschulen in Bayern (Framework for examinations and curricula for the Bavarian universities of applied science), Figure 8.3.

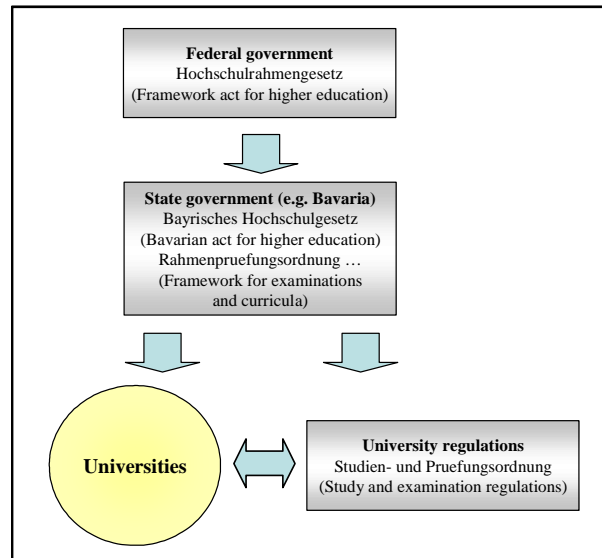


Figure 8.3: Laws and regulation for German universities

Source: Developed by researcher

Universities can select the courses for the curricula at their own discretion. They can select obligatory, mandatory electives (student must select one course from a list) and elective courses.

The researcher suggests offering mandatory elective or elective courses in strategic management to engineers.

The necessity of strategic management education in engineering faculties must be addressed to policy makers and stakeholders in the higher education of engineers, Figure 8.4.

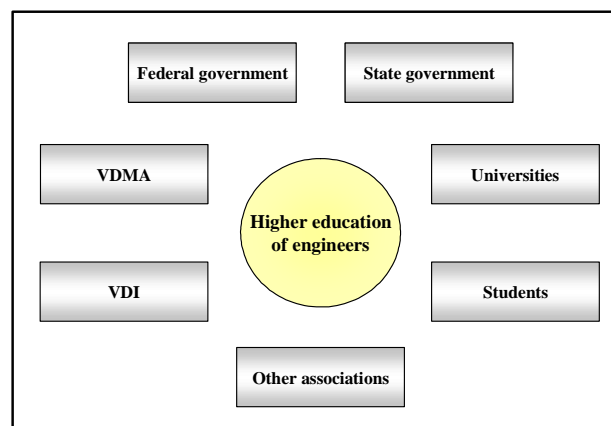


Figure 8.4: Policy makers and stakeholders in management education

Source: Developed by researcher

To make them aware of the necessity of strategic management education for engineers, elements of Kotler's marketing mix can be used in a "marketing plan". Publications, presentations, letters, petitions and visits are recommended. The researcher intends to pursue this issue and plans to become a visiting lecturer of strategic management at universities.

8.5.2 Strategic management and pedagogy

Not only business economists, but also MBAs complain about the lack of praxis orientation in the pedagogy of management education. The researcher would recommend the optimisation of the mix of academic and practical strategic management education and pedagogy at German universities. This can be accomplished by:

- Case studies on real existing companies
- Assigning students to real existing companies
- Adding experienced managers with academic background to the teaching body

8.5.3 Strategic management made easy

Executives complain about complex and theoretical strategic management tools. The researcher recommends that academics designing and publishing strategic management tools and processes should consider this by:

- Using the language of SME leaders
- Explaining the tools, their purpose, advantage and benefit
- Avoiding foreign language terms where possible or, at least by translating them
- Visualising tools where feasible to allow understanding at a glance

The researcher recommends the strategic management map for business excellence depicted (Figure Apx. 14) and described in the appendix C.

8.5.4 Leader's licence for students, upcoming managers and executives

Someone who wants to drive a car, needs a driver's licence. Another person who wants to hunt, needs a shotgun licence. James Bond has a licence to kill. Why not a "leader's licence" for people who want or have to lead a company? The poor reputation of top managers (Podolny, 2009) supports this recommendation. The leadership licence could be obtained during university study, or through continued professional development. The researcher plans to develop a concept for a leader's licence and publish it.

The researcher will further contribute to the body of knowledge and society by following up on recommendations.

The next section introduces opportunities for further research.

8.6 Opportunities for future research

As listed above, some questions came up in the course of data analysis and evaluation which are addressed in this section as opportunities for future research. The researcher will seek participation in further projects of this area of research.

Quality of strategic management in the research sector

Evidence of quality problems pertaining to the strategic planning process emerged. Qualitative research with a series of in depth case studies in companies of the machinery and equipment industry sector would shed more light to this issue.

Strategic management and performance over time

A research project with a longitudinal approach is recommended to study the further development of strategic management education and practice and its long term effect upon performance in companies of the machinery and equipment industry sector.

The role of R&D in the research sector of machinery and equipment

Qualitative research with a series of in depth case studies on the innovation power of companies in Germany and those in other nations is recommended.

Strategic management in other industry sectors

Companies in the machinery and equipment industry sector have an advanced position in the value chain or are at the end. SMEs supplying to the automotive industry are in most cases not in this advanced position. They are under constant cost and performance pressure from car manufacturers. A research project, similar to this one, would allow the comparison of the machinery and equipment sector's strategic management practice with another important industry sectors.

Issue of "gut feeling" versus structured strategic management

A responding executive came up with this issue. Qualitative research with in depth interviews and observations would answer, whether and to what extent executives rely on "gut feeling" in their decision process and how this impacts on performance outcome.

Comparison of the machinery and equipment sector in different countries

The researcher recommends a comparison of the strategic management of the German machinery and equipment sector with the same sector in other countries and with companies which are equally successful or less successful. The results would lead to better understanding of success factors and their impact on performance.

Knowledge absorption, seniority and "wisdom"

A combined quantitative and qualitative research project could provide knowledge for the question: "Why are executives not applying more of their acquired knowledge? It could shed more light on evidence that emerged on the positive impact of seniority on performance despite older executives having less knowledge of and little practice in strategic management tools. Will human resource departments have to rethink their employment philosophy which favours young executives who are encouraged to rotate in managerial positions?

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Appendix A Covering letter or e-mail and questionnaire



University
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Company name
Title, name, function
Street

D-1111 City

??.08.2008

Research project: The Effects of Management Education upon Strategic Practice and Performance: The Case of the German SME Sector Machinery and Equipment

Dear Mr., Mrs. XYZ

Small and medium sized enterprises have to be aware of and address a wide range of issues that impact upon their business environment, such as regulatory change; policy directives; new competitors; emerging technologies; and, general social and economic instability. Research suggests that to manage in a climate of change a strategic managerial response is required and that this in turn necessitates an engagement with management education.

The above research project, linked to a wider doctoral study, aims to evaluate the current status and scope of management education within your business sector and to evaluate its impact upon both strategic practice and business performance. Ultimately, the research outputs will assist in shaping educational policy, identify a model of best practice, and, most importantly, assist enterprises in determining how best to support their strategic intent.

It is important, given the strategic focus, that the research questions are addressed by senior executives representing the **machinery and equipment sector**.

We know that your time is limited and precious. Thus your cooperation, by completing the attached questionnaire, would be greatly appreciated: it should take around **10 to 15 minutes**. It should be returned, anonymously if you wish, in the envelope enclosed. As a token of gratitude we will, if you wish, provide you with an executive summary of our findings as well as a guideline regarding strategic planning and management tools. This will require you to provide an e-mail address with your return. In addition, by way of encouragement to participate, we will send to every 20th respondent a bottle (Bocksbeutel) of the famous Franconian Vine.

We are confident that our research will contribute to the future success of the machinery and equipment SME sector.

All data received will be treated with the strictest confidentiality according to the data protection regulations and principles of ethical research adhered to by the University of Glasgow: <http://www.gla.ac.uk/faculties/lbss/research/ethics/>

Thank you very much for your participation and cooperation.

Sincerely

Richard Wagner

Prof. Dr. Robert A. Paton

Attachments: Questionnaire, return-envelope and complementary pen

Supervisors:

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Prof. Dr. Robert Macintosh Tel: +44 141 330 4938 e-mail: rmacintosh@lss.gla.ac.uk
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Glasgow G12 8QQ; Scotland; <http://www.gla.ac.uk/>

Questionnaire for Research Project:

“The Effects of Management Education upon Strategic Practice and Performance: The Case of
the German SME Sector Machinery and Equipment”

The above research project, linked to a wider doctoral study, aims to evaluate the current status and scope of management education within business sector machinery and equipment and to evaluate its impact upon both strategic practice and business performance. Ultimately, the research outputs will assist in shaping educational policy, identify a model of best practice, and, most importantly, assist enterprises in determining how best to support their strategic intent.

Addressed are senior executives representing companies of the industry sector machinery and equipment sector in Germany.

Please fill out the questionnaire and send it back to the attention of (postage will be paid by the researcher):

Richard Wagner

Am See 7

D-97456 Dittelbrunn-Hambach

If you have any questions please contact:

Richard Wagner, Am See 7, 97456-Dittelbrunn-Hambach Tel.: 0172 61 25 800 e-mail: r.wagner.l@research.gla.ac.uk

Or the supervising Professors:

Prof. Dr. Robert A. Paton Tel.: (+44) 0141 330 5037 e-mail: r.paton@lbss.gla.ac.uk

Prof. Dr. Robert MacIntosh Tel.: (+44) 0141 330 4938 e-mail: r.macintosh@lbss.gla.ac.uk

University of Glasgow, Faculty of Law, Business and Social Sciences; Department of Management; West Quadrangle; Gilbert Scott Building; Glasgow G12 8QQ; Scotland; <http://www.gla.ac.uk/>

All data received will be treated with the strictest confidentiality according to the data protection regulations and principles of ethical research adhered to by the University of Glasgow:

<http://www.gla.ac.uk/faculties/lbss/research/ethics/>

For this survey the Database of Hoppenstedt Firmeninformationen GmbH, Darmstadt, Germany, was used.



Section 1: Questions pertaining the company's executive

1.1 What is your age?

Please note your age: _____ Years

1.2 What is your gender?

☐ Female

☐ Male

1.3 What is your position in your company?

☐ Managing partner

☐ Managing director

☐ Manager finance / controlling

☐ Manager marketing / sales

☐ Manager production

☐ Manager R&D

Other position, please specify:

1.4 For how many years are you in that position?

Please note the number of years: _____ Years

1.5 What is your professional education? (multiple choice possible)

Educational area A, pre-graduate

☐ Facharbeiter

☐ Meister

☐ Techniker

Other qualification, please specify:

Educational area B, graduate

☐ Dipl.-Ing.

☐ Dipl.-Wirtsch.-Ing.

☐ Dipl.-Kfm. / Dipl.- Volkswirt / Dipl.-Betriebswirt

☐ Rechtsanwalt (lawyer)

Other qualification, please specify:

Educational area C (post-graduate)

☐ Dr. Ing.

☐ Dr. rer. nat. / Dr. jur. / Dr. phil.

☐ BBA (Bachelor of Business Administration)

☐ MBA (Master of Business Administration)

Other qualification, please specify:

1.6 What knowledge about the following general management and strategic management tools have you acquired during your education and is the respective tool applied in your company? (multiple choice possible)

	Educational area A, pre-graduate	Educational area B, graduate	Educational area C, post-graduate	In seminars	Self-study	No knowledge	Tool unknown	Applied in Company	
								Yes	No
Benchmarking	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
SWOT (strength, weaknesses, opportunities, threats)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Five competitive forces (Porter)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Scenario technique	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Vision	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Mission statement	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Corporate identity programme	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
BCG growth-share matrix (Boston Consulting Group)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Attractiveness-business-strength matrix (McKinsey)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Market-life-cycle-competitive-strength matrix	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Product market grid (Ansoff)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Strategy maps	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Quality management ISO 9000	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
TQM (total quality management)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
EFQM model (European Foundation of Quality Mgmt.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Six sigma	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Supply chain management	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Continuous improvement programme (e.g. Kaizen)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Skill management	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Change management	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Market segmentation / differentiation / positioning	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Marketing mix (Kotler, 4 Ps)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Key account management	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Innovation management	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Knowledge management	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Overhead value analysis	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Zero base budgeting	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Activity database	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Balanced scorecards	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Risk management system	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Early warning system	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other general management and strategic management knowledge, please specify:									

1.7 Where you satisfied with the general management and strategic management education during your educational phases? If not why?

	Very satisfied	Satisfied	Dissatisfied	Very dissatisfied	Not applicable
Educational area A, pre-graduate (Meister, Techniker)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Educational area B, graduate (University)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Educational area C, BBA	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Educational area C, MBA	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

If you were not satisfied please give comments about why and state your expectations regarding strategic management education:

1.8 How do you keep your general management and strategic management knowledge up to date? (multiple choice possible)

- | | |
|---|--|
| <input type="checkbox"/> Seminars, workshops, trainings | <input type="checkbox"/> Exchange of experience with other companies |
| <input type="checkbox"/> Management books | <input type="checkbox"/> Management journals |
| <input type="checkbox"/> Internet downloads | |

Other measures, please specify:

1.9 How many seminar or trainings days have you spent on general management and strategic management education in the last five years?

Please note the number of days: _____ Days

Comments:

1.10 Who else in your company has strategic management knowledge? (multiple choice possible)

	Excellent knowledge	Good knowledge	Little knowledge	No knowledge	Do not know
The senior executive colleague B (if applicable)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The senior executive colleague C (if applicable)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Assistant to the senior executive(s)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Manager finance / controlling	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Manager marketing / sales	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Manager production	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Manager R&D	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (please note):	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (please note):	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Comments:					

Section 2: Questions pertaining strategic management practice

2.1 What is your perception of strategic management?

Please briefly describe your perception of strategic management:

2.2 Who in your company is responsible for strategic management? (one answer please)

- | | |
|---|---|
| <input type="checkbox"/> I am responsible | <input type="checkbox"/> Managing partner |
| <input type="checkbox"/> Managing director | <input type="checkbox"/> Assistant to the senior executive(s) |
| <input type="checkbox"/> Manager finance / controlling | <input type="checkbox"/> Manager marketing / sales |
| <input type="checkbox"/> Manager production | <input type="checkbox"/> Manager R&D |
| <input type="checkbox"/> Employee with strategic management knowledge | <input type="checkbox"/> Executive management team |
| <input type="checkbox"/> Strategy office | <input type="checkbox"/> External consultant |
| <input type="checkbox"/> We do not apply strategic management | |
- Other person, please specify:

2.3 How is strategic planning carried out in your company? (one answer please)

- | | |
|--|--|
| <input type="checkbox"/> Annually in combination with operative planning | <input type="checkbox"/> Annually <u>and</u> on demand (incident driven) |
| <input type="checkbox"/> On demand (incident driven) only | <input type="checkbox"/> Once in a while |
| <input type="checkbox"/> Not at all (please go to question 2.4) | |

Other, please specify:

2.4 In your company a strategic planning process is not installed. What are the reasons why? (multiple choice possible)

- | | |
|---|---|
| <input type="checkbox"/> Missing knowledge | <input type="checkbox"/> No resources |
| <input type="checkbox"/> Time constraints | <input type="checkbox"/> Cost constraints |
| <input type="checkbox"/> Too complex | <input type="checkbox"/> Too theoretical |
| <input type="checkbox"/> Not necessary for management | |

Other reason(s), please specify:

2.5 Your company is doing strategic planning. What are the motives? (multiple choice possible, please skip this question if strategic planning is not carried out)

- | | |
|---|---|
| <input type="checkbox"/> It is important for future sustained success | <input type="checkbox"/> The owner requires it |
| <input type="checkbox"/> The mother company requires it | <input type="checkbox"/> The bank has asks for it |
| <input type="checkbox"/> Is recommended by external consultants | |

Other motive(s), please specify:

2.6 Since when is your company doing strategic planning?

Please note the year: _____

2.7 What activities are planned to improve general / strategic management knowledge and practice in your company? (multiple choice possible)

- | | |
|--|--|
| <input type="checkbox"/> Seminars, workshops, trainings | <input type="checkbox"/> Exchange of experience with other companies |
| <input type="checkbox"/> Provision of literature (books, management journal, etc.) | <input type="checkbox"/> Engage an external consultant |
| <input type="checkbox"/> Assign person or team for strategic planning | <input type="checkbox"/> Establish a strategy office |
| <input type="checkbox"/> Assign budget for strategic planning process | <input type="checkbox"/> No activities planned |

Other activities and measures, please specify:

2.8 How does your company deal with the key elements of strategic planning such as vision, objectives, strategy? (multiple choice possible)

- | | |
|---|---|
| <input type="checkbox"/> Only available to top management | <input type="checkbox"/> Available to all persons in managing positions |
| <input type="checkbox"/> Communicated to all employees | <input type="checkbox"/> Communicated to equity owners |
| <input type="checkbox"/> Communicated to major creditors | <input type="checkbox"/> Communicated to partner companies |
| <input type="checkbox"/> Communicated major customers | <input type="checkbox"/> Communicated to major suppliers |

Other, please specify:

2.9 How are strategic plans executed in your company? (multiple choice possible)

- | | |
|--|--|
| <input type="checkbox"/> System of objectives top down | <input type="checkbox"/> Follow up in specific strategy meetings |
| <input type="checkbox"/> Follow up in normal management meetings | <input type="checkbox"/> Follow up by strategy office |
| <input type="checkbox"/> Follow up by external consultant | <input type="checkbox"/> Use of activity database |
| <input type="checkbox"/> Use of key figure tables | <input type="checkbox"/> Use of balanced scorecard |
| <input type="checkbox"/> We have no strategic plan | |

Other measures, please specify:

Section 3: Questions pertaining the company's performance

3.1 What is the legal form of your company? (one answer please)

- | | |
|-------------------------------|--|
| <input type="checkbox"/> GmbH | <input type="checkbox"/> GmbH & Co. KG |
| <input type="checkbox"/> OHG | <input type="checkbox"/> KG |
| <input type="checkbox"/> AG | <input type="checkbox"/> GbR |
| <input type="checkbox"/> Ltd | |

Other legal form, please specify:

3.2 Is your company independent, part of a larger organisation and/or does it own subsidiaries? (one answer please)

- | | |
|---|--|
| <input type="checkbox"/> Independent without subsidiary | <input type="checkbox"/> Part of larger organisation |
| <input type="checkbox"/> Independent with subsidiary | <input type="checkbox"/> Part of larger organisation with own subsidiary |

Comments:

3.3 Which branch does your company belong to? (one answer please)

- ☐ NACE 29.11 Manufacture of engines and turbines, except aircraft, vehicle and cycle engines
- ☐ NACE 29.12 Manufacture of pumps and compressors
- ☐ NACE 29.13 Manufacture of taps and valves
- ☐ NACE 29.14 Manufacture of bearings, gears, gearing and driving elements
- ☐ NACE 29.21 Manufacture of furnaces and furnace burners
- ☐ NACE 29.22 Manufacture of lifting and handling equipment
- ☐ NACE 29.23 Manufacture of non-domestic cooling and ventilation equipment
- ☐ NACE 29.24 Manufacture of other general purpose machinery n.e.c.
- ☐ NACE 29.31 Manufacture of agricultural tractors
- ☐ NACE 29.32 Manufacture of other agricultural and forestry machinery
- ☐ NACE 29.41 Manufacture of portable hand held power tools
- ☐ NACE 29.42 Manufacture of other metalworking machine tools
- ☐ NACE 29.43 Manufacture of other machine tools n.e.c.
- ☐ NACE 29.51 Manufacture of machinery for metallurgy
- ☐ NACE 29.52 Manufacture of machinery for mining, quarrying and construction
- ☐ NACE 29.53 Manufacture of machinery for food, beverage and tobacco processing
- ☐ NACE 29.54 Manufacture of machinery for textile, apparel and leather production
- ☐ NACE 29.55 Manufacture of machinery for paper and paperboard production
- ☐ NACE 29.56 Manufacture of other special purpose machinery n.e.c.

Comments:

3.4 In what year was your company founded?

Please note the year of foundation: _____

Comments:

3.5 Was your company merged or acquired or has your company acquired another company within the last five years? (multiple choice possible)

- ☐ Our company was merged with another company
- ☐ Our company was acquired by another company
- ☐ We acquired another company

Comments:

3.6 What was the turnover of your company in 2007?

Please note the turnover: _____mioEUR

Comments:

3.7 How many persons did your company employ in average in 2007?

Please note the number of employees: _____ Employees

Comments:

3.8 What was the return on sales in your company in 2007? (ROS = profit or loss before tax / turnover * 100)

- | | |
|--|--|
| <input type="checkbox"/> Up to 1.00% | <input type="checkbox"/> 1.01 – 2.00 % |
| <input type="checkbox"/> 2.01 – 3.00 % | <input type="checkbox"/> 3.01 – 4.00 % |
| <input type="checkbox"/> 4.01 – 5.00 % | <input type="checkbox"/> 5.01 – 6.00 % |
| <input type="checkbox"/> 6.01 – 7.00 % | <input type="checkbox"/> 7.01 – 8.00 % |
| <input type="checkbox"/> 8.01 – 9.00 % | <input type="checkbox"/> 9.01 – 10.00 % |
| <input type="checkbox"/> 10.01 – 11.00 % | <input type="checkbox"/> 11.01 – 12.00 % |
| <input type="checkbox"/> 12.01 – 13.00 % | <input type="checkbox"/> 13.01 – 14.00 % |
| <input type="checkbox"/> 14.01 – 15.00 % | <input type="checkbox"/> 15.01 – 16.00 % |
| <input type="checkbox"/> 16.01 – 17.00 % | <input type="checkbox"/> Above 17% |

Comments:

3.9 What was the R & D ratio in your company in 2007? (R & D ratio = R & D expenditures / turnover * 100)

- | | |
|--|--|
| <input type="checkbox"/> Up to 1.00% | <input type="checkbox"/> 1.01 – 2.00 % |
| <input type="checkbox"/> 2.01 – 3.00 % | <input type="checkbox"/> 3.01 – 4.00 % |
| <input type="checkbox"/> 4.01 – 5.00 % | <input type="checkbox"/> 5.01 – 6.00 % |
| <input type="checkbox"/> 6.01 – 7.00 % | <input type="checkbox"/> 7.01 – 8.00 % |
| <input type="checkbox"/> 8.01 – 9.00 % | <input type="checkbox"/> 9.01 – 10.00 % |
| <input type="checkbox"/> 10.01 – 11.00 % | <input type="checkbox"/> 11.01 – 12.00 % |
| <input type="checkbox"/> Above 12% | |

Comments:

3.10 What was the equity ratio in 2007? (equity ratio = equity / total assets * 100)

- | | |
|--|--|
| <input type="checkbox"/> Up to 5.00% | <input type="checkbox"/> 5.01 – 10.00 % |
| <input type="checkbox"/> 10.01 – 15.00 % | <input type="checkbox"/> 15.01 – 20.00 % |
| <input type="checkbox"/> 20.01 – 25.00 % | <input type="checkbox"/> 25.01 – 30.00 % |
| <input type="checkbox"/> 30.01 – 35.00 % | <input type="checkbox"/> 35.01 – 40.00 % |
| <input type="checkbox"/> 40.01 – 45.00 % | <input type="checkbox"/> 45.01 – 50.00 % |
| <input type="checkbox"/> 50.01 – 55.00 % | <input type="checkbox"/> 55.01 – 60.00 % |
| <input type="checkbox"/> 60.01 – 65.00 % | <input type="checkbox"/> 65.01 – 70.00 % |
| <input type="checkbox"/> 70.01 – 75.00 % | <input type="checkbox"/> Above 75% |

Comments:

3.11 How many suggestions have been made by employees of the company within the continuous improvement programme in 2007?

Please note the number of suggestions: _____

☐ No continuous improvement programme in place

Comments:

3.12 Was the year 2007 a normal business year or where there any anomalies that strongly influenced the performance of the company? (multiple choice possible) What was the bottom line impact in percent on the company's performance?

☐ Restructuring /downsizing effort; extra high costs

☐ Upsizing of the company; extra high costs

☐ Product / other liabilities; extra high costs

☐ Divestment of assets under book value, high costs

☐ Extra asset write-offs; extra high costs

☐ Divestment of assets, above book value, extra high revenue

☐ Sale of a patent or license, extra high revenue

☐ No anomalies

Please state the consolidated bottom line impact in + or - %:

Other anomalies; comments:

3.13 What are the company's major challenges within the next two years?

☐ No major challenges visible within the next 2 years

Please list the challenges ahead you perceive:

3.14 How will you meet these challenges?

☐ No measures required

Please list the measures planned to cope with the challenges ahead:

Section 4: Optional information

The information to the following is optional.

If you and your company wish to remain anonymous please send the completed questionnaire back without the following information.

If you and your company wish to receive a copy of executive summary of our findings, a guideline regarding strategic planning and management tools, and possibly receive a bottle of Franconian wine please give the following information.

Your name: _____

Your telephone number: _____

Your e-Mail address: _____

Company: _____

Street: _____

Postal code, town: _____

Do you wish to participate with your company in a comprehensive case study?

The purpose of the case study in several companies is to explore the strategic management knowledge level in the first and second hierarchical level as well as the company's praxis and procedures regarding strategic planning.

After finishing the case study you will receive the results of the analysis, a guideline for strategic planning, and a book on the topic strategy and management tools.

☐ Yes

☐ No

☐ Would like to receive more information

Comments:

Thank you very much for your cooperation and time spent!

We greatly appreciate your support.

Appendix B Facts and figures from the survey

Distribution of the education of the respondents; detailed listing

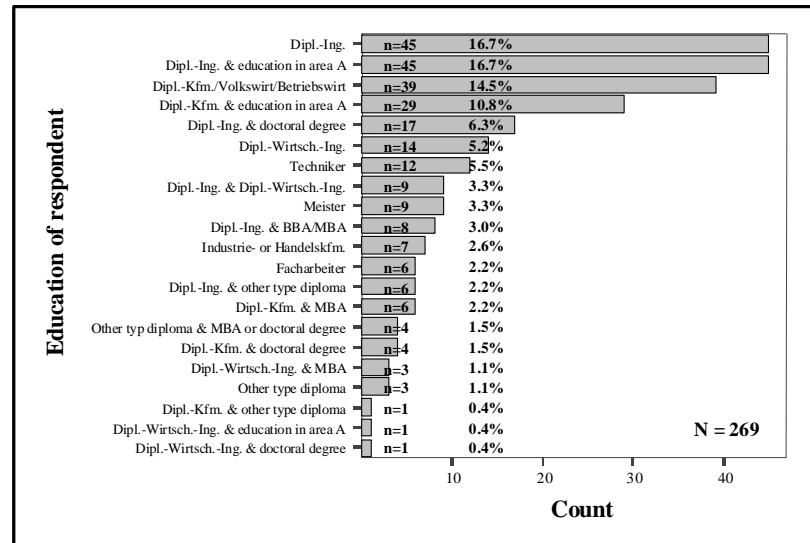


Figure Apx. 1: Education of the respondents

Source: Developed by researcher

Distribution of the legal form of responding companies

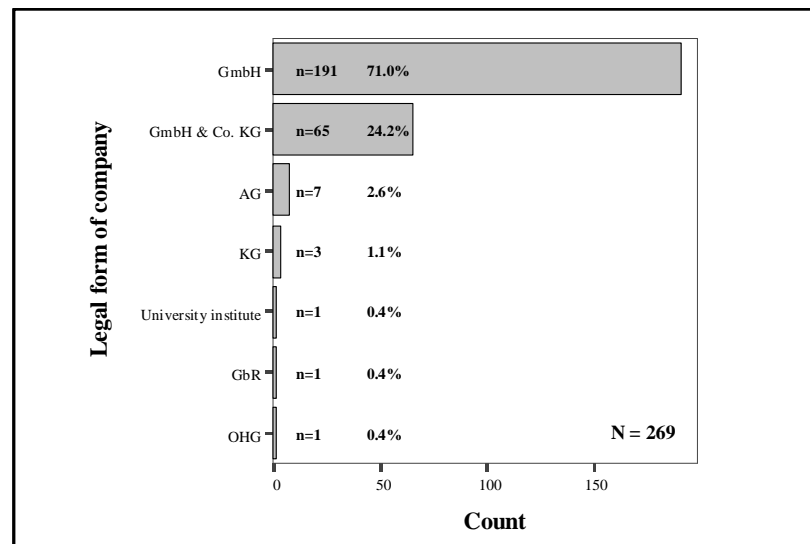


Figure Apx. 2: Legal form of responding companies

Source: Developed by researcher

Distribution of the year the responding companies were founded

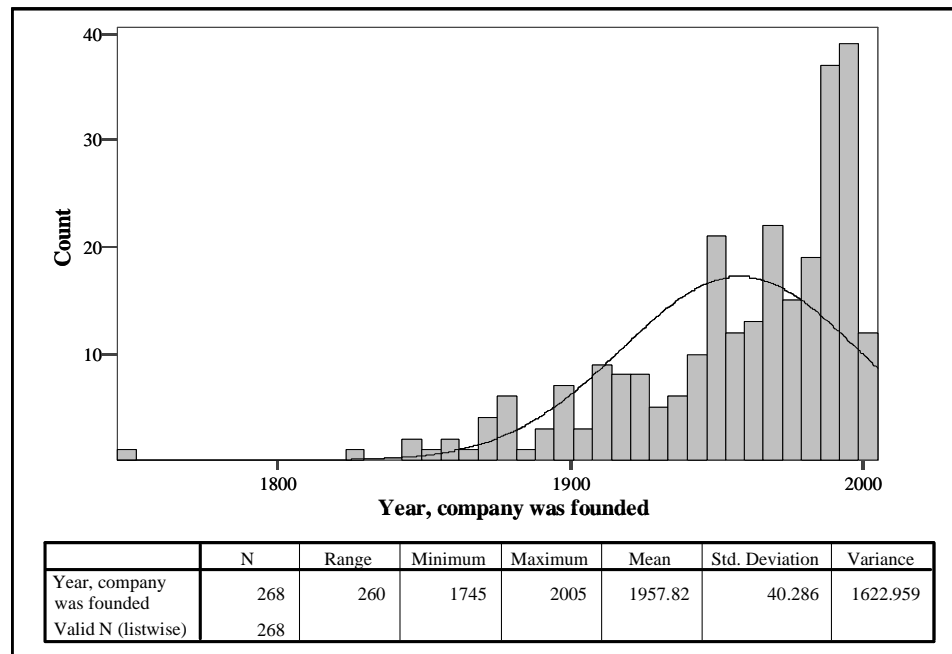


Figure Apx. 3: Year company was founded

Source: Developed by researcher

Distribution of the branch the responding companies belong to

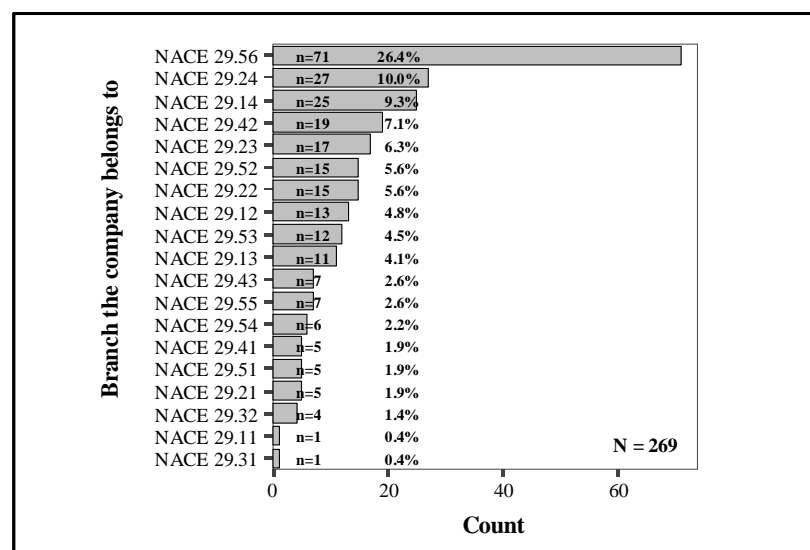


Figure Apx. 4: Branch of responding companies

Source: Developed by researcher

Integration status of the responding companies

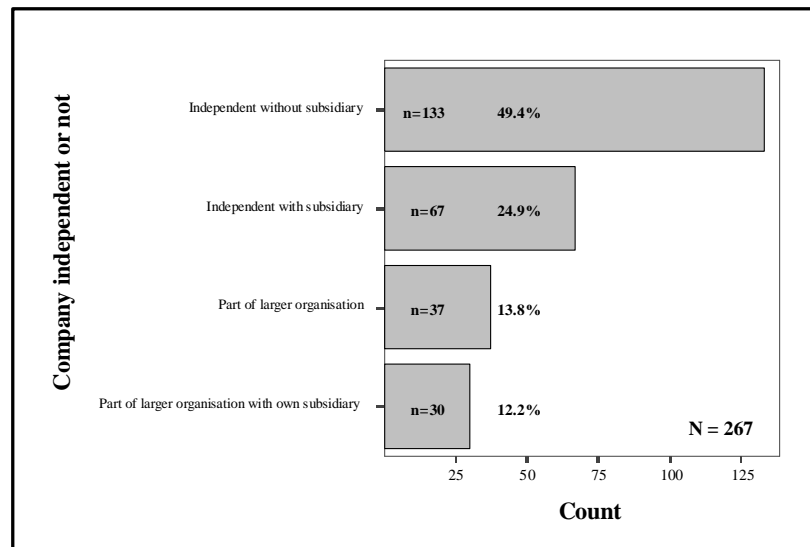


Figure Apx. 5: Integration of the company

Source: Developed by researcher

Merger and acquisition activities of the responding companies

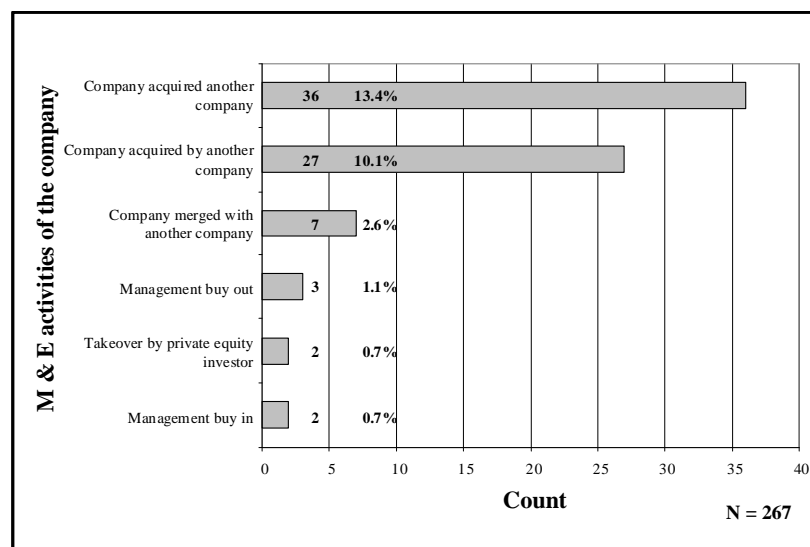


Figure Apx. 6: M & E activities of responding companies

Source: Developed by researcher

Anomalies the responding companies were faced in the business year 2007

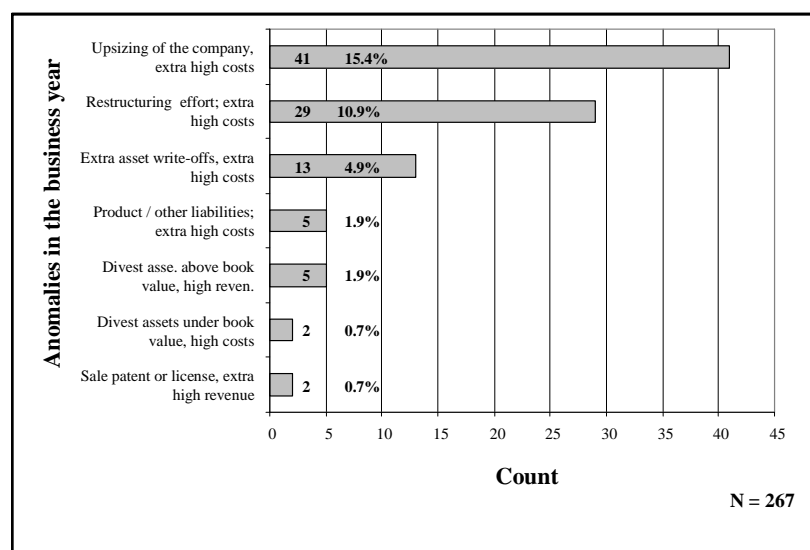


Figure Apx. 7: Anomalies in business year 2007

Source: Developed by researcher

Distribution of the turnover per employee of responding companies

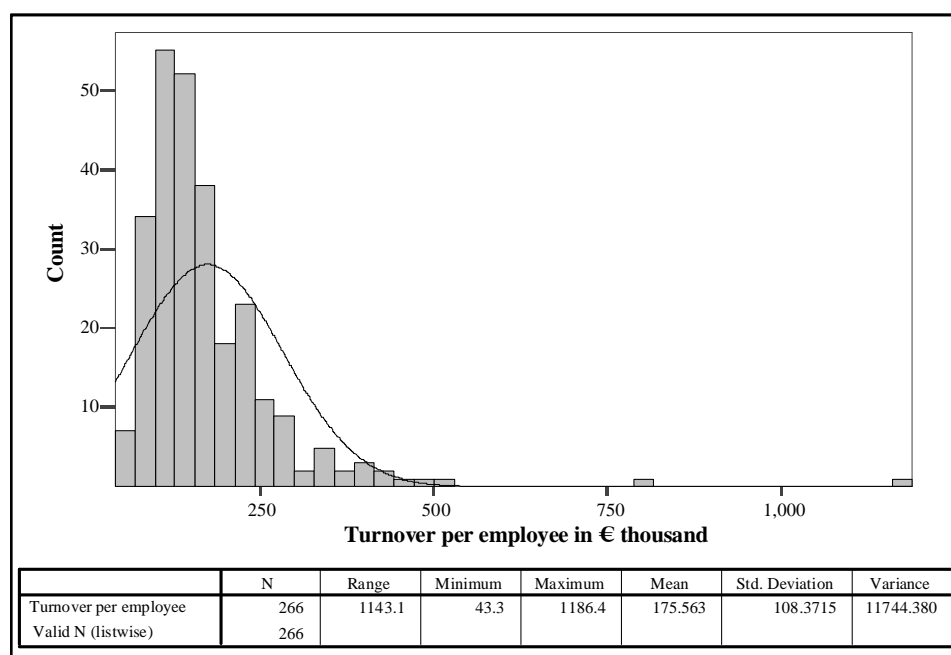


Figure Apx. 8: Turnover per employee of responding companies

Source: Developed by researcher

Distribution of the return on sales of the responding companies

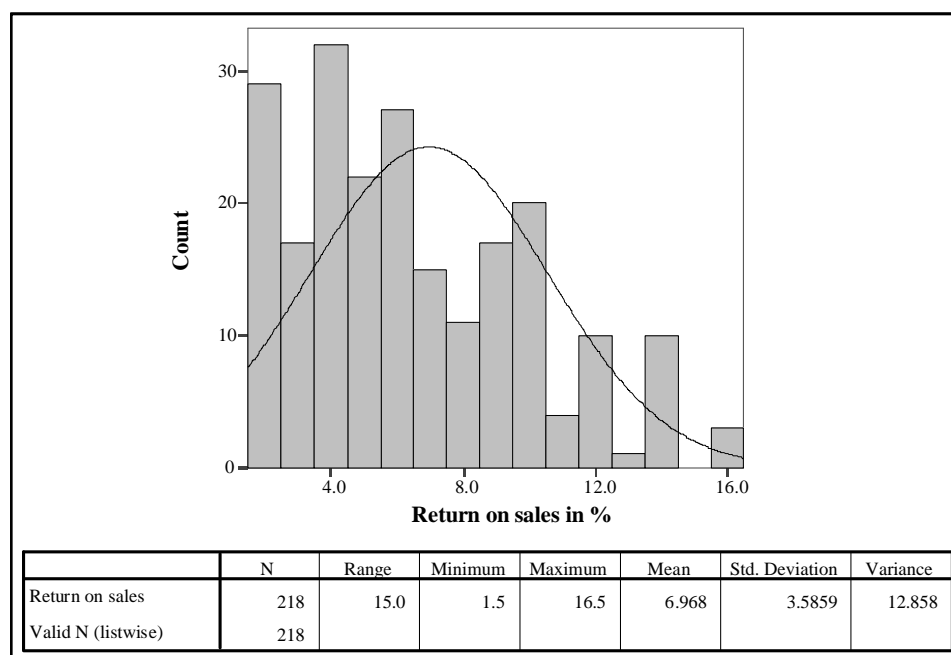


Figure Apx. 9: ROS adjusted of responding companies

Source: Developed by researcher

Distribution of the equity ratio of the responding companies

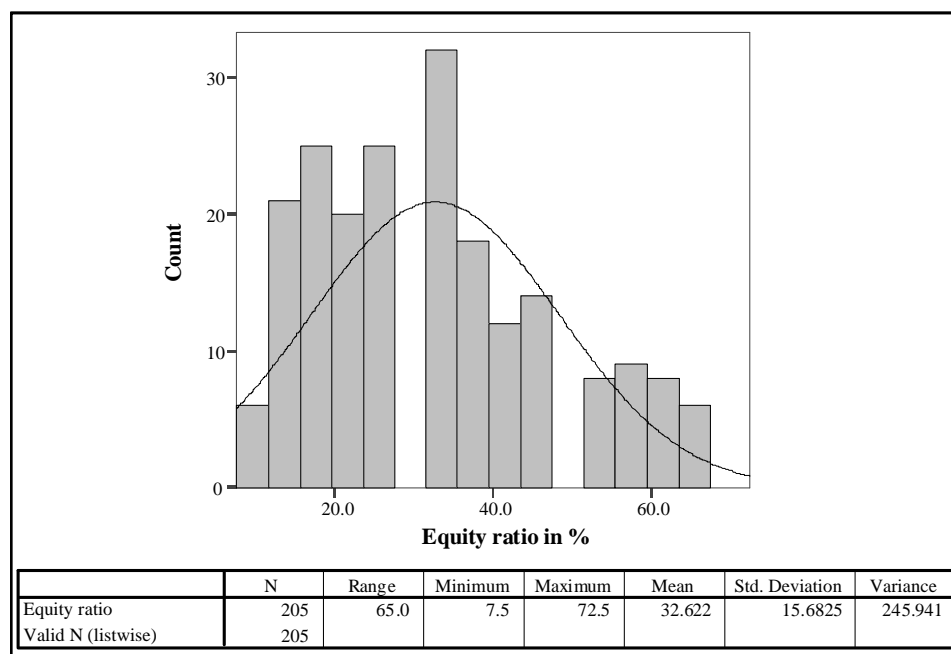


Figure Apx. 10: Equity ratio of responding companies

Source: Developed by researcher

Distribution of the R&D ratio of the responding companies

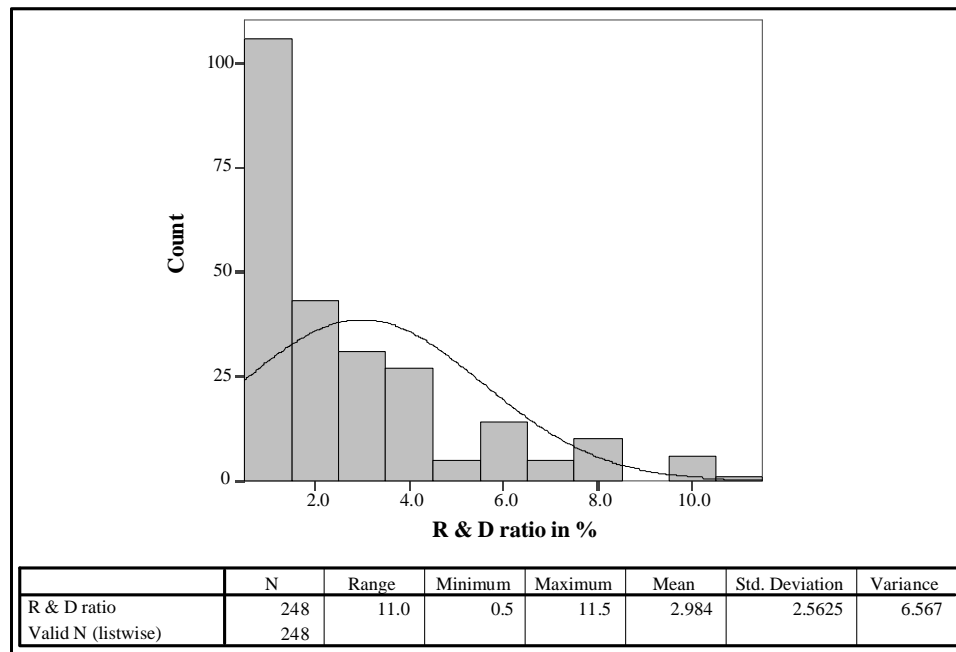


Figure Apx. 11: R&D ratio of responding companies

Source: Developed by researcher

Distribution of the suggestions per employee of the responding companies

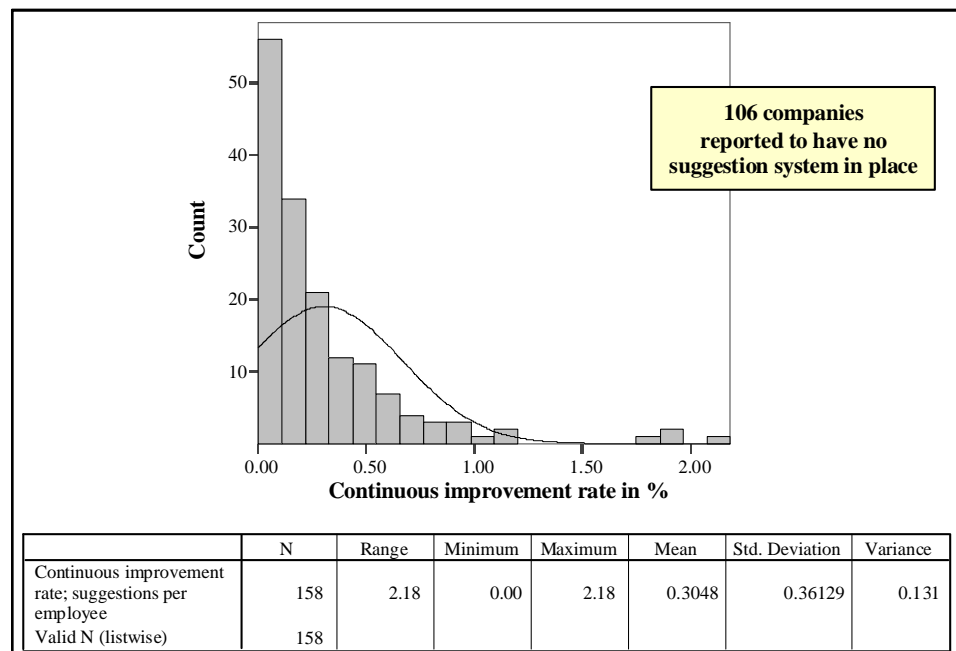


Figure Apx. 12: Continuous improvement rate in responding companies

Source: Developed by researcher

SM tools acquired at university or via seminars / self-study by education types

Strategic management tool	Acquired through	Education of respondent											
		Technical education area A	Dipl.-Ing.	Dipl.-Kfm.	Dipl.-Wirtsch.-Ing.	MBA	Other education						
Benchmarking	Educational area B	0	0.0%	10	14.1%	35	58.3%	16	69.6%	3	50.0%	0	0.0%
	In seminars	7	70.0%	27	38.0%	12	20.0%	4	17.4%	1	16.7%	5	83.3%
	Self-study	3	30.0%	34	47.9%	13	21.7%	3	13.0%	2	33.3%	1	16.7%
SWOT	Educational area B	0	0.0%	6	13.3%	24	57.1%	10	52.6%	3	75.0%	0	0.0%
	In seminars	2	40.0%	19	42.2%	14	33.3%	7	36.8%	0	0.0%	3	60.0%
	Self-study	3	60.0%	20	44.4%	4	9.5%	2	10.5%	1	25.0%	2	40.0%
Five competitive forces (Porter)	Educational area B	0	0.0%	2	11.1%	26	81.3%	10	83.3%	2	66.7%	0	0.0%
	In seminars	0	0.0%	8	44.4%	3	9.4%	1	8.3%	0	0.0%	1	100.0%
	Self-study	3	100.0%	8	44.4%	3	9.4%	1	8.3%	1	33.3%	0	0.0%
Scenario technique	Educational area B	0	0.0%	6	14.0%	28	62.2%	8	66.7%	3	42.9%	0	0.0%
	In seminars	6	54.5%	13	30.2%	10	22.2%	3	25.0%	1	14.3%	2	66.7%
	Self-study	5	45.5%	24	55.8%	7	15.6%	1	8.3%	3	42.9%	1	33.3%
Vision	Educational area B	0	0.0%	7	10.6%	26	55.3%	8	53.3%	2	40.0%	0	0.0%
	In seminars	10	62.5%	26	39.4%	15	31.9%	4	26.7%	2	40.0%	2	33.3%
	Self-study	6	37.5%	33	50.0%	6	12.8%	3	20.0%	1	20.0%	4	66.7%
Mission statement	Educational area B	0	0.0%	2	6.1%	22	56.4%	4	33.3%	2	33.3%	0	0.0%
	In seminars	4	57.1%	16	48.5%	10	25.6%	4	33.3%	2	33.3%	2	50.0%
	Self-study	3	42.9%	15	45.5%	7	17.9%	4	33.3%	2	33.3%	2	50.0%
Corporate identity programme	Educational area B	0	0.0%	8	12.1%	40	65.6%	10	47.6%	2	25.0%	0	0.0%
	In seminars	10	62.5%	27	40.9%	16	26.2%	3	14.3%	3	37.5%	5	71.4%
	Self-study	6	37.5%	31	47.0%	5	8.2%	8	38.1%	3	37.5%	2	28.6%
BCG growth-share matrix	Educational area B	0	0.0%	9	22.5%	38	71.7%	12	75.0%	3	60.0%	0	0.0%
	In seminars	7	70.0%	14	35.0%	11	20.8%	4	25.0%	0	0.0%	1	50.0%
	Self-study	3	30.0%	17	42.5%	4	7.5%	0	0.0%	2	40.0%	1	50.0%
Attractiveness-business-strengths matrix	Educational area B	0	0.0%	6	23.1%	30	69.8%	7	58.3%	1	25.0%	0	0.0%
	In seminars	5	62.5%	9	34.6%	9	20.9%	2	16.7%	0	0.0%	1	50.0%
	Self-study	3	37.5%	11	42.3%	4	9.3%	3	25.0%	3	75.0%	1	50.0%
Market-life-cycle-compet.-strength matr.	Educational area B	0	0.0%	10	21.7%	52	85.2%	14	73.7%	4	100.0%	0	0.0%
	In seminars	6	66.7%	17	37.0%	5	8.2%	3	15.8%	0	0.0%	3	75.0%
	Self-study	3	33.3%	19	41.3%	4	6.6%	2	10.5%	0	0.0%	1	25.0%
Product market grid (Ansoff)	Educational area B	0	0.0%	3	20.0%	34	82.9%	7	63.6%	1	100.0%	0	0.0%
	In seminars	4	80.0%	4	26.7%	4	9.8%	1	9.1%	0	0.0%	2	100.0%
	Self-study	1	20.0%	8	53.3%	3	7.3%	3	27.3%	0	0.0%	0	0.0%
Strategy maps	Educational area B	0	0.0%	1	4.3%	14	45.2%	4	40.0%	3	75.0%	0	0.0%
	In seminars	3	42.9%	11	47.8%	11	35.5%	4	40.0%	0	0.0%	0	0.0%
	Self-study	4	57.1%	11	47.8%	6	19.4%	2	20.0%	1	25.0%	2	100.0%
Quality management ISO 9000	Educational area B	0	0.0%	16	15.5%	16	26.2%	7	31.8%	4	40.0%	0	0.0%
	In seminars	15	78.9%	56	54.4%	31	50.8%	7	31.8%	4	40.0%	7	70.0%
	Self-study	4	21.1%	31	30.1%	14	23.0%	8	36.4%	2	20.0%	3	30.0%
TQM (total quality management)	Educational area B	0	0.0%	11	16.2%	18	36.0%	10	45.5%	3	42.9%	0	0.0%
	In seminars	9	75.0%	27	39.7%	21	42.0%	7	31.8%	3	42.9%	5	71.4%
	Self-study	3	25.0%	30	44.1%	11	22.0%	5	22.7%	1	14.3%	2	28.6%
EFQM model	Educational area B	0	0.0%	3	11.1%	3	18.8%	3	42.9%	2	50.0%	0	0.0%
	In seminars	1	100.0%	13	48.1%	4	25.0%	3	42.9%	1	25.0%	0	0.0%
	Self-study	0	0.0%	11	40.7%	9	56.3%	1	14.3%	1	25.0%	2	100.0%
Six sigma	Educational area B	0	-	2	4.5%	7	25.0%	4	28.6%	1	14.3%	0	0.0%
	In seminars	0	-	22	50.0%	9	32.1%	4	28.6%	2	28.6%	3	75.0%
	Self-study	0	-	20	45.5%	12	42.9%	6	42.9%	4	57.1%	1	25.0%
Supply chain management	Educational area B	0	0.0%	9	14.5%	23	40.4%	8	44.4%	5	55.6%	0	0.0%
	In seminars	2	28.6%	24	38.7%	20	35.1%	3	16.7%	1	11.1%	3	42.9%
	Self-study	5	71.4%	29	46.8%	14	24.6%	7	38.9%	3	33.3%	4	57.1%
Continuous improvement programme	Educational area B	0	0.0%	14	15.4%	26	41.9%	11	45.8%	3	37.5%	0	0.0%
	In seminars	12	63.2%	34	37.4%	22	35.5%	7	29.2%	2	25.0%	5	71.4%
	Self-study	7	36.8%	43	47.3%	14	22.6%	6	25.0%	3	37.5%	2	28.6%
Skill management	Educational area B	0	0.0%	4	16.7%	10	29.4%	2	28.6%	1	33.3%	0	0.0%
	In seminars	2	66.7%	7	29.2%	10	29.4%	3	42.9%	1	33.3%	1	33.3%
	Self-study	1	33.3%	13	54.2%	14	41.2%	2	28.6%	1	33.3%	2	66.7%
Change management	Educational area B	0	0.0%	1	2.9%	11	31.4%	7	43.8%	1	16.7%	0	0.0%
	In seminars	3	75.0%	15	44.1%	14	40.0%	4	25.0%	2	33.3%	2	100.0%
	Self-study	1	25.0%	18	52.9%	10	28.6%	5	31.3%	3	50.0%	0	0.0%
Market segment/different./position.	Educational area B	0	0.0%	7	13.5%	38	64.4%	13	68.4%	2	33.3%	0	0.0%
	In seminars	7	63.6%	13	25.0%	12	20.3%	4	21.1%	4	66.7%	3	60.0%
	Self-study	4	36.4%	32	61.5%	9	15.3%	2	10.5%	0	0.0%	2	40.0%
Marketing mix (Kotler, 4 Ps)	Educational area B	0	0.0%	5	21.7%	41	89.1%	13	81.3%	2	100.0%	0	0.0%
	In seminars	4	80.0%	6	26.1%	3	6.5%	2	12.5%	0	0.0%	2	40.0%
	Self-study	1	20.0%	12	52.2%	2	4.3%	1	6.3%	0	0.0%	3	60.0%
Key account management	Educational area B	0	0.0%	12	17.1%	34	60.7%	9	50.0%	3	60.0%	0	0.0%
	In seminars	8	61.5%	24	34.3%	11	19.6%	6	33.3%	1	20.0%	0	0.0%
	Self-study	5	38.5%	34	48.6%	11	19.6%	3	16.7%	1	20.0%	5	100.0%
Innovation management	Educational area B	0	0.0%	11	15.9%	20	40.8%	7	41.2%	2	33.3%	0	0.0%
	In seminars	7	53.8%	23	33.3%	13	26.5%	6	35.3%	2	33.3%	2	50.0%
	Self-study	6	46.2%	35	50.7%	16	32.7%	4	23.5%	2	33.3%	2	50.0%
Knowledge management	Educational area B	0	0.0%	5	7.8%	19	42.2%	9	50.0%	3	50.0%	0	0.0%
	In seminars	7	58.3%	20	31.3%	13	28.9%	3	16.7%	1	16.7%	1	33.3%
	Self-study	5	41.7%	39	60.9%	13	28.9%	6	33.3%	2	33.3%	2	66.7%
Overhead value analysis	Educational area B	0	0.0%	13	21.3%	44	75.9%	10	50.0%	3	30.0%	0	0.0%
	In seminars	5	41.7%	23	37.7%	9	15.5%	3	15.0%	4	40.0%	4	80.0%
	Self-study	7	58.3%	25	41.0%	5	8.6%	7	35.0%	3	30.0%	1	20.0%
Zero base budgeting	Educational area B	0	0.0%	1	5.9%	28	73.7%	4	44.4%	3	50.0%	0	0.0%
	In seminars	1	33.3%	7	41.2%	6	15.8%	3	33.3%	2	33.3%	2	50.0%
	Self-study	2	66.7%	9	52.9%	4	10.5%	2	22.2%	1	16.7%	2	50.0%
Activity database	Educational area B	0	0.0%	2	6.1%	8	32.0%	3	27.3%	1	20.0%	0	0.0%
	In seminars	3	37.5%	7	21.2%	6	24.0%	1	9.1%	3	60.0%	0	0.0%
	Self-study	5	62.5%	24	72.7%	11	44.0%	7	63.6%	1	20.0%	4	100.0%
Balanced scorecards	Educational area B	0	0.0%	3	6.7%	16	32.0%	7	41.2%	2	33.3%	0	0.0%
	In seminars	5	83.3%	18	40.0%	22	44.0%	5	29.4%	2	33.3%	4	80.0%
	Self-study	1	16.7%	24	53.3%	12	24.0%	5	29.4%	2	33.3%	1	20.0%
Risk management system	Educational area B	0	0.0%	7	10.4%	20	33.9%	6	35.3%	2	28.6%	0	0.0%
	In seminars	10	62.5%	21	31.3%	17	28.8%	4	23.5%	2	28.6%	2	50.0%
	Self-study	6	37.5%	39	58.2%	22	37.3%	7	41.2%	3	42.9%	2	50.0%
Early warning system	Educational area B	0	0.0%	4	8.0%	21	38.9%	9	52.9%	2	33.3%	0	0.0%
	In seminars	7	50.0%	12	24.0%	15	27.8%	2	11.8%	2	33.3%	2	50.0%
	Self-study	7	50.0%	34	68.0%	18	33.3%	6	35.3%	2	33.3%	2	50.0%
Total	Educational area B	0	0.0%	200	13.4%	772	53.7%	252	51.3%	74	42.0%	0	0.0%
	In seminars	172	60.4%	563	37.6%	378	26.3%	117	23.8%	48	27.3%	75	56.0%
	Self-study	113	39.6%	733	49.0%	287	20.0%	122	24.8%	54	30.7%	59	44.0%

Table Apx. 1: SM tools acquired by education types

Source: Developed by researcher

Comparing strategic management tools acquired and applied by executives

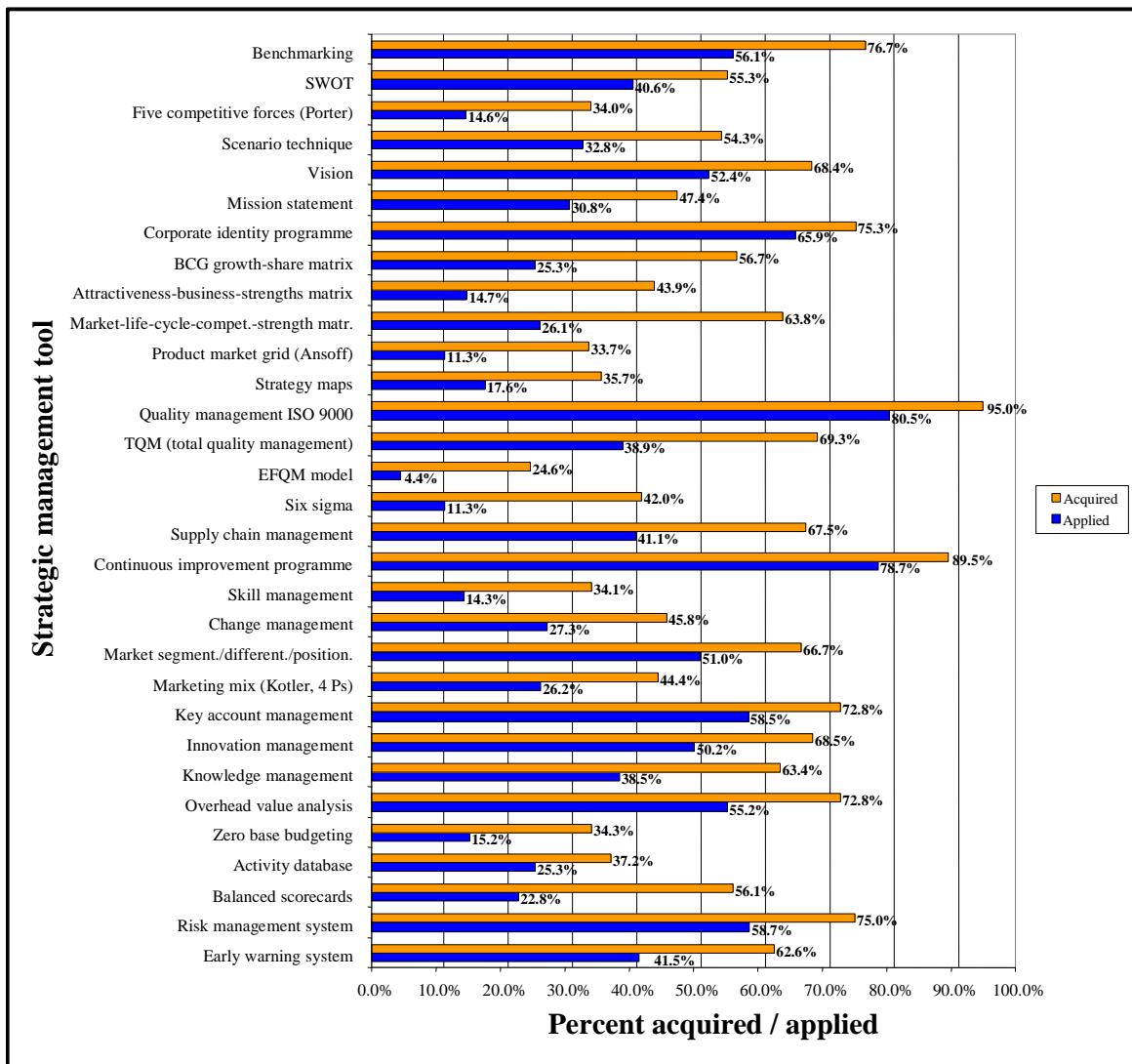


Figure Apx. 13: Strategic management tools acquired and applied

Source: Developed by researcher

Relation of strategic management tool application with performance

Strategic management tool	Level of significance Sig.				
	Turnover per employee	Return on Sales	Equity ratio	R&D ratio	Continuous improvement rate
Benchmarking	0.010	0.226	0.972	0.367	0.073
SWOT	0.001	0.469	0.561	0.345	0.505
Five competitive forces (Porter)	0.275	0.605	0.974	0.244	0.626
Scenario technique	0.164	0.413	0.325	0.183	0.872
Vision	0.387	0.961	0.735	0.144	0.893
Mission statement	0.009	0.351	0.338	1.000	0.307
Corporate identity programme	0.198	0.935	0.182	0.519	0.423
BCG growth-share matrix	0.526	0.166	0.522	0.022	0.251
Attractiveness-business-strengths matrix	0.626	0.112	0.323	0.036	0.879
Market-life-cycle-compet.-strength matr.	0.370	0.111	0.196	0.089	0.199
Product market grid (Ansoff)	0.662	0.054	0.069	0.834	0.958
Strategy maps	0.389	0.802	0.223	0.603	0.325
Quality management ISO 9000	0.825	0.763	0.612	0.994	0.265
TQM (total quality management)	0.648	0.039	0.789	0.037	0.985
EFQM model	0.899	0.789	0.118	0.103	0.383
Six sigma	0.802	0.871	0.910	0.432	0.962
Supply chain management	0.485	0.839	0.932	0.107	0.830
Continuous improvement programme	0.635	0.062	0.216	0.220	0.220
Skill management	0.122	0.869	0.783	0.676	0.265
Change management	0.424	0.345	0.808	0.293	0.965
Market segment./different./position.	0.928	0.750	0.087	0.794	0.846
Marketing mix (Kotler, 4 Ps)	0.740	0.321	0.106	0.482	0.639
Key account management	0.220	0.480	0.717	0.112	0.786
Innovation management	0.679	0.479	0.241	0.030	0.234
Knowledge management	0.605	0.907	0.238	0.128	0.182
Overhead value analysis	0.036	0.050	0.195	0.221	0.873
Zero base budgeting	0.188	0.203	0.405	0.212	0.760
Activity database	0.788	0.654	0.517	0.200	0.980
Balanced scorecards	0.023	0.079	0.289	0.076	0.557
Risk management system	0.050	0.657	0.147	0.962	0.859
Early warning system	0.158	0.879	0.885	0.099	0.322

Table Apx. 2: Relation SM tool application with performance

Source: Developed by researcher

Appendix C The strategic management map for business excellence

The researcher recommends the strategic management map for use in SMEs. It visualises at a glance the major tools, process and integration of strategic management.

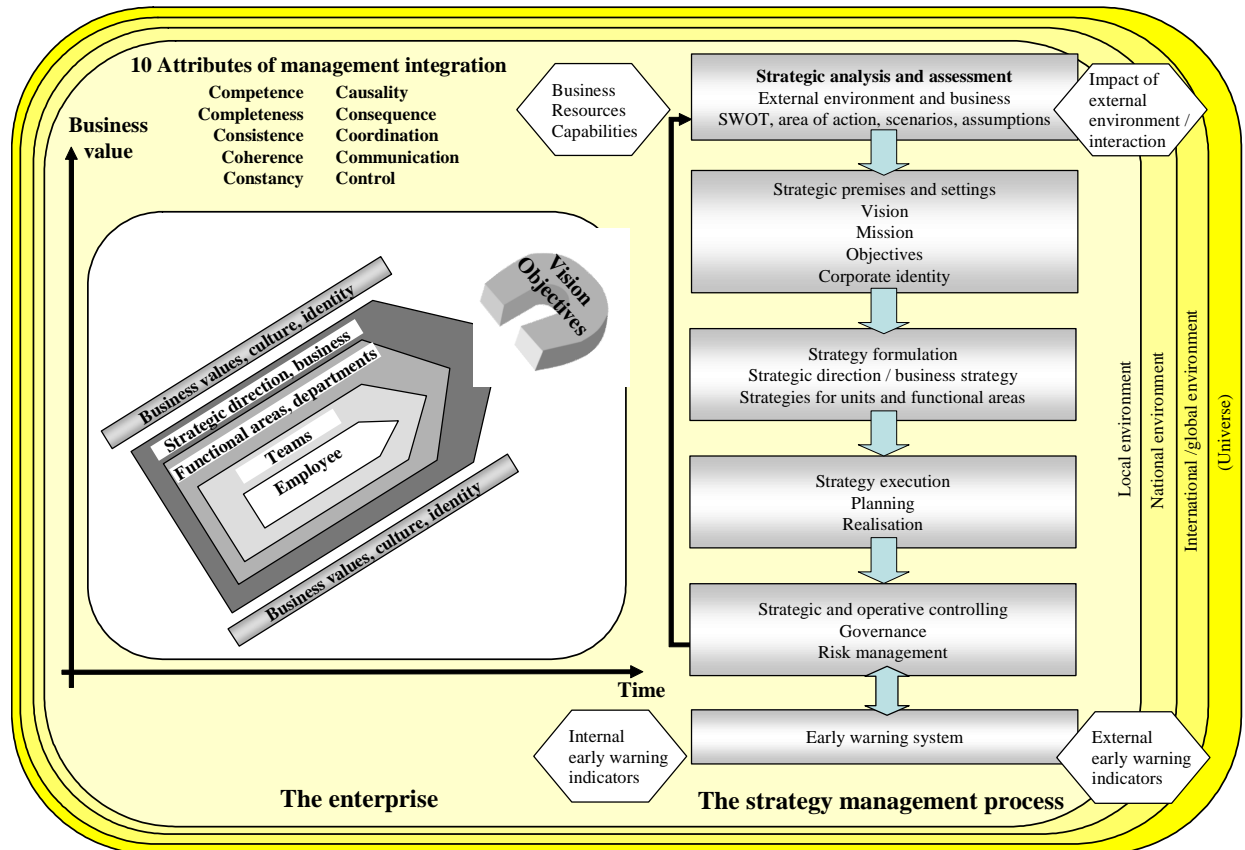


Figure Apx. 14: The strategic management map for business excellence

Source: Developed by researcher

The following briefly describes the strategic management map. The company is embedded in several layers of the external environment; the local environment, the national environment and the international or global environment. Organisations, competitors, the media, etc. set trends and have an impact on business in the ecological, economic, social, political and technological dimension. The business interacts with these environmental layers. Some companies, those in information technology or in the aerospace business, for example, have to consider the layer that surrounds our planet. There are not yet customers or organisations out there, but there is technical and ecological impact. For instance, waves of increased radiation from outer space can influence computers and information technology network components.

The overall objective is to increase the value of the enterprise over time. Value can be expressed and increased in many ways and in all aspects of the business such as better image, improved processes, higher employee motivation, higher market share, better prices, more information about competitors, higher customer satisfaction rate, higher customer loyalty rate, fewer complaints, more innovation and higher profit.

With strategic direction the business pursues its vision and long term objectives. Both, the vision and the long term objectives, function like a “magnet”. The business, its units, departments, teams and employees are attracted and aligned. They all point like vectors to the vision and long term strategies. Vectors pointing to another direction indicate waste of resources, inefficiency, risks and mistakes.

Business values, business culture and the identity of the enterprise are the borders, the guidelines for all managers and employees. The ethical code of the company does not allow the crossing of these borders.

Strategic management is an iterative process and applied on a regular basis or on demand. The strategic management process consists of the following phases. The first three phases represent the scope of strategic planning:

- Strategic analysis: A comprehensive analysis of all relevant layers of the business environment, the business resources and business abilities; the findings can then be assessed in a SWOT matrix; areas of action and assumptions are decided for the short term perspective; for the long term perspective different scenarios can be developed
- Strategic premises and settings: With the input from the strategic analysis the vision, mission and objectives are formulated or updated; the business values, culture, corporate identity are established or reviewed
- Strategy formulation: Here the strategic direction and business strategy, as well as strategies for business units and functional areas are decided or reviewed
- Strategy execution: The planning, organising and the realisation of objectives and strategies begins
- Strategic and operative controlling: It is very important for the success of a business to check on a regular basis with tools such as key figures, audits, reviews whether the business is still on the right track and aligned to the vision, long term, medium term and long term objectives
- Early warning system: The company has to establish a set of indicators in the different layers of the environment and the business itself that may strongly influence the course and success of the business; threshold values are set; if an actual values exceeds the threshold value, certain mechanisms or processes are triggered, e. g. the review of a certain strategy

The researcher defined the following ten elements of management integration. These ten elements are starting with C to make them easier to memorise (“ten commandments of management integration”). They could also be called the ten commandments of leadership, or the ten principles of integrated management.

1. Competence: Appropriate skills at all levels of the organisation regarding management practices, business processes, etc; focus on all employees as the key

to success; learning organisation; knowledge management; human resource development; the right person in the right position

2. Completeness: Holistic thinking and behaviour of the leaders and employees; multi-focus, multi-strategy; all levels; all functions, all employees; use of synergy
3. Consistence: Consistence of business and functional strategies, concepts and action; interrelation and integration of business functions
4. Coherence: Coherence of thinking, planning, intent and doing; values and human-social dimension; do not “pray for water and drink wine”
5. Constancy: Constancy in strategies, concepts and action; don’t replace a winning horse; stick to the strategies unless there is real demand for change
6. Causality: Causal versus symptomatic approach to business analysis, problem solving and decision making; e.g. don’t fire the marketing manager if the controller did a poor job
7. Consequence: Consequent follow up and follow through (closed loop approach) of concepts and activities in all levels of the business; cascade objectives
8. Coordination: Coordination of all organisational units; streamlining the business; do not allow organisational units to go in different direction; stick to the mission
9. Communication: Keep all stakeholders informed of business intentions and results; communicate strategy, vision, objectives, mission
10. Control: Being in control at any time in any area of the business; define “intelligent” controlling systems; avoid nasty surprises